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Our Aviation Operational Environment is unique





We have a wide variety of aviation tools



Applying Today's Technology to a New World



Every fire is unique



Tom Iraci, USFS

In some of the most remote or
complex airspace in the US



Tom Iraci, USFS

Fires can create their own weather



Tom Iraci, USFS

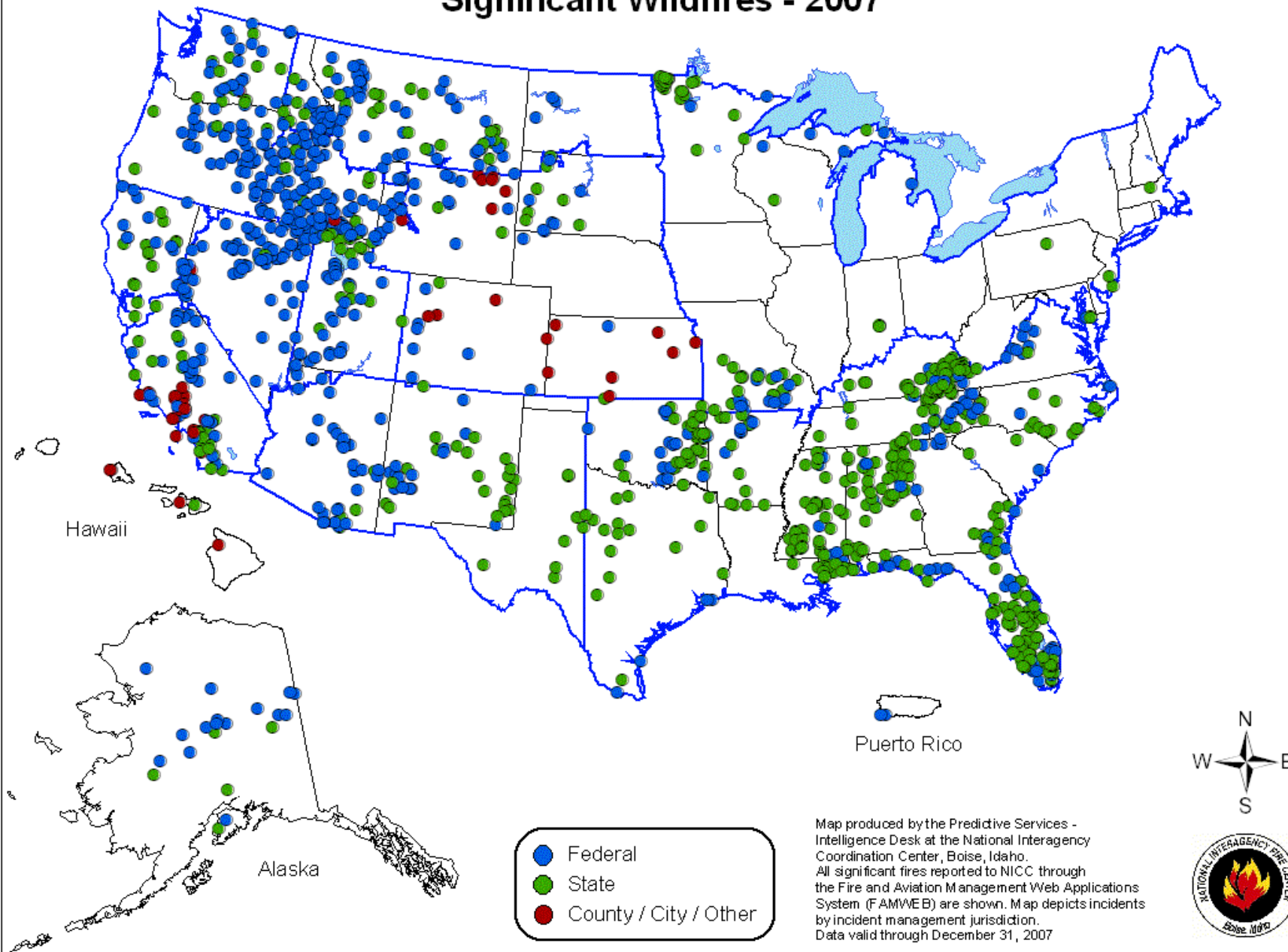
Lightning is a great equalizer



2007 Fire Season

- 10 year average is 78,251 fires for 5.86 million acres
- 2007 saw 85,705 fires for 9.32 million acres
- AGAIN
 - One of the nations worst fire seasons

Significant Wildfires - 2007

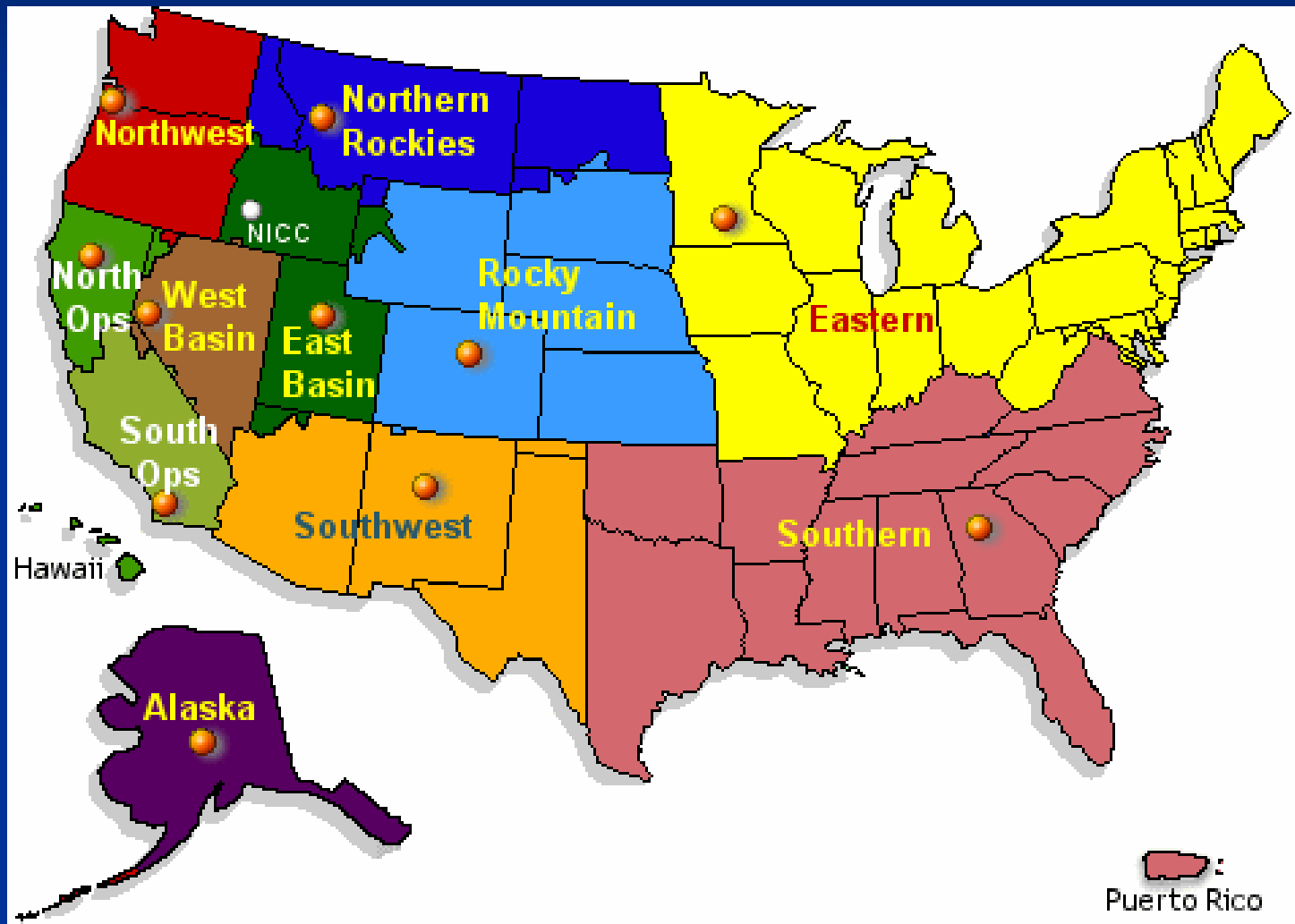


How do we organize our Response?

Through a systematic dispatch response which tracks all resources assigned to an incident



Geographical Area Coordination Centers



NIFC/NICC

National Interagency Fire Center



Incident Management Team



Air Operations Organization

- Unit Aviation Officer
- Aircraft Dispatcher
- Airspace Coordinator



- Air Operations Branch Director (AOBD)
- Air Support Group Supervisor (ASGS)
- Air Tactical Group Supervisor (Air Attack)
- Helibase Manager



USFS Airspace Program started in the 1980's



To Prevent Midair Collisions!

Our working environment is a “TFR”

A “TFR” is a TEMPORARY flight RESTRICTION enacted by the FAA, at the request of a responsible party, in order to enhance aviation safety.

Codified in 14CFR 91.137, 14CFR 91.138, 14CFR 91.141, 14CFR 91.143, 14CFR 91.145 and 99.7

14CFR 91.137(a)(2)...



Provide safe environment for operation of disaster relief aircraft.

91.137 (a) 2 Exceptions

- ✱ Aircraft is **participating** in relief activities under the direction of the official in charge of on-scene emergency response activities
- ✱ Operating under ATC approved **IFR flight plan**

91.137 (a)2 Exceptions

Law Enforcement Aircraft



91 137 (a) 2 Exceptions

- ✱ Operations directly to/from airport within the TFR,
- ✱ or as required to maintain VFR due to weather or terrain,
- ✱ and with the approval of the specified FSS or ATC facility,
- ✱ and the operation **does not hamper** or endanger relief efforts,
- ✱ and the operation is not to observe the incident.



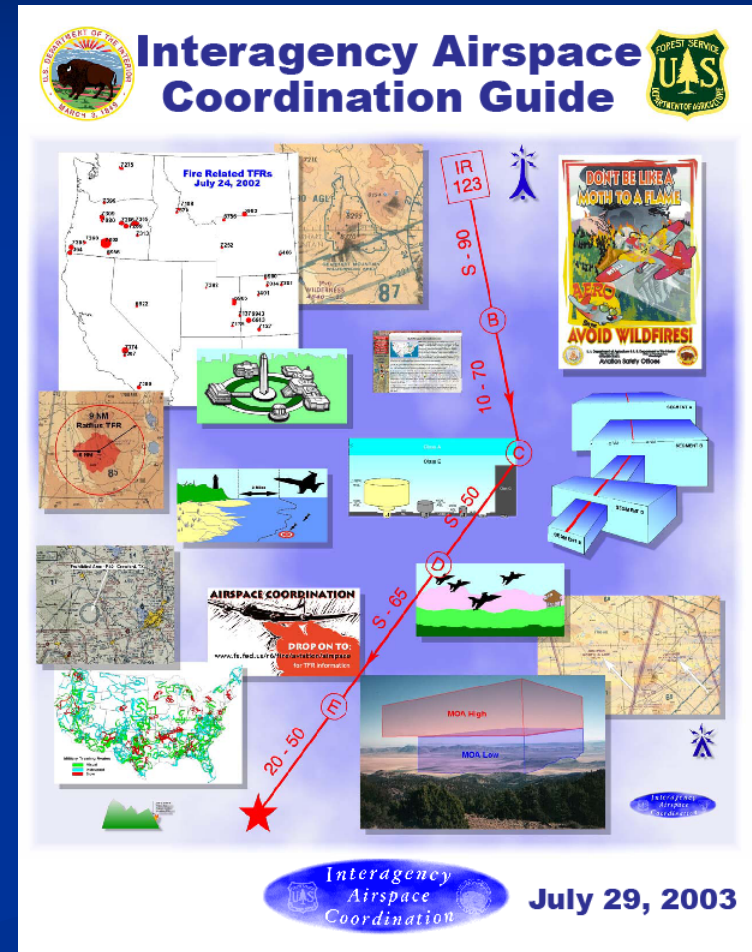
91.137 (a) 2 Exceptions

✱ Accredited **media** under a flight plan approved by the FSS or ATC facility.... and at an altitude above those being utilized by relief aircraft, unless authorized by disaster officials



Interagency Airspace Coordination Guide

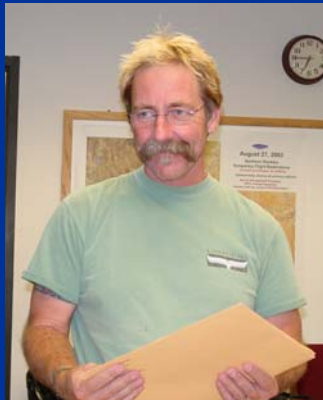
- Developed in 1988
- Revised in 2003
- Provides guidance to USFS and DOI on airspace issues



National Fire Fighting Transponder Code (1997)



Airspace Coordinators (1998)



Interagency Airspace Website (2000)

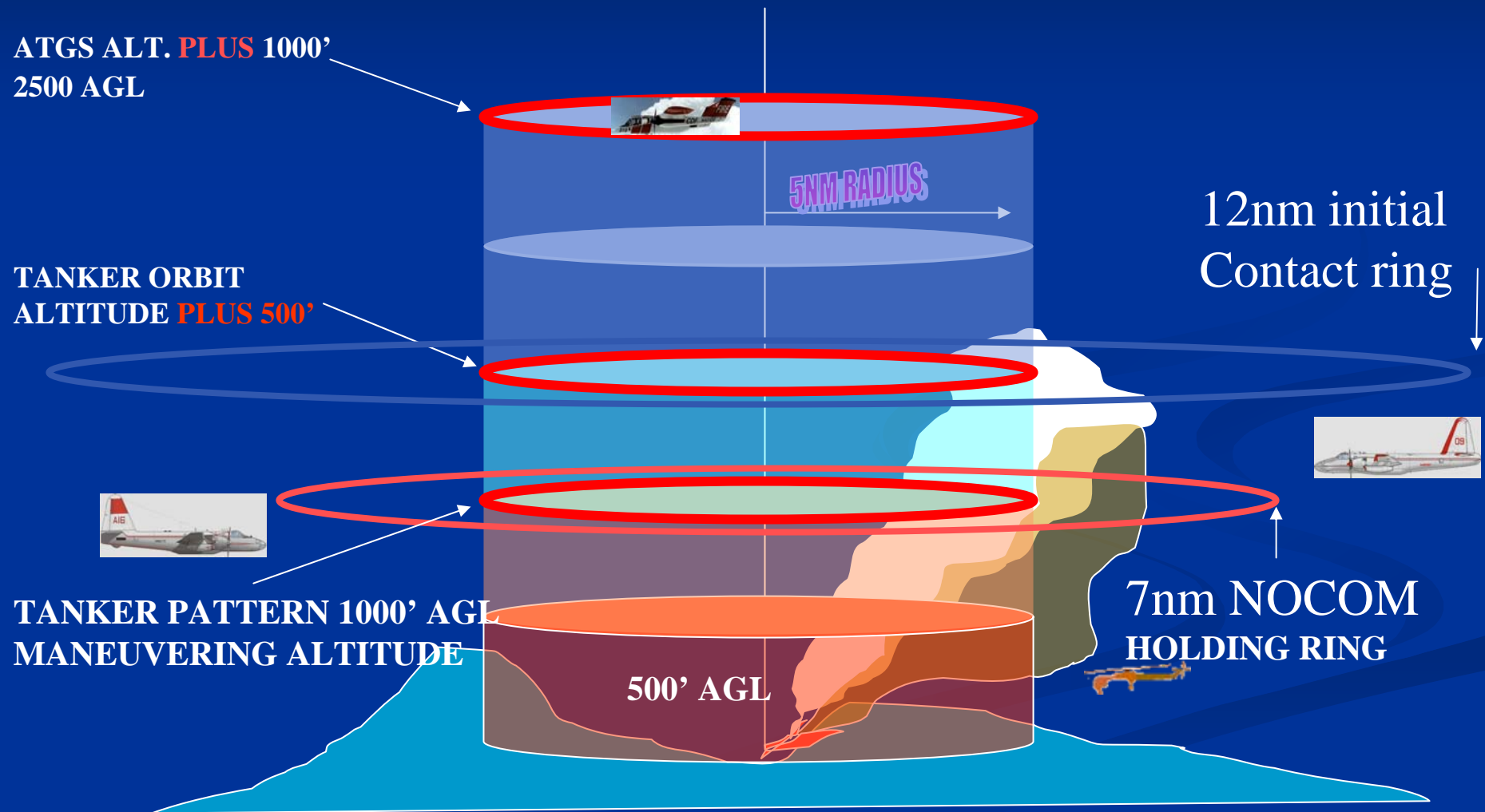


Fire Traffic Area (FTA)

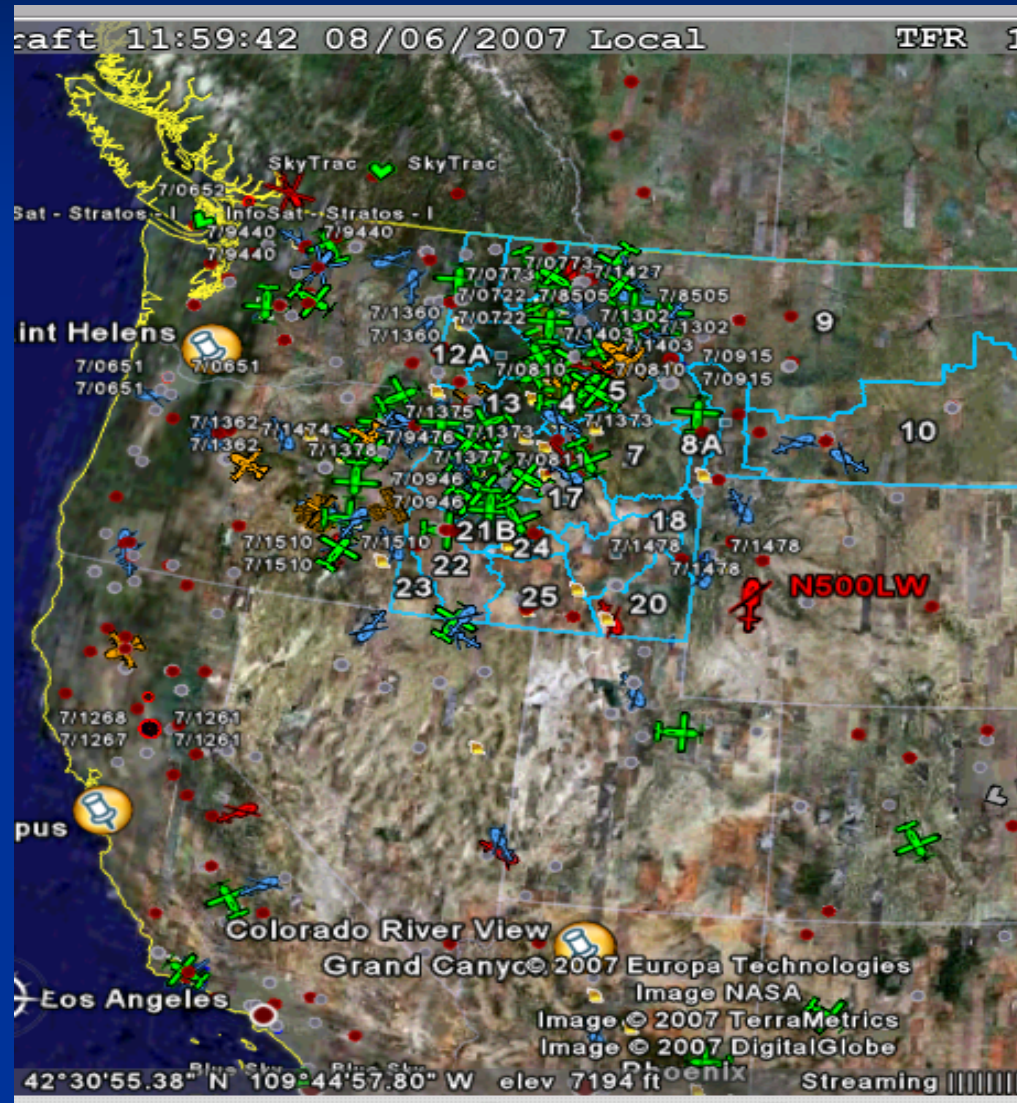
A large fire is burning in the background, with thick black smoke rising into the sky. In the foreground, there is a road and a red fire hydrant. The scene is set against a bright, hazy sky.

Provides standardized airspace structure to enhance separation of aircraft over incidents.

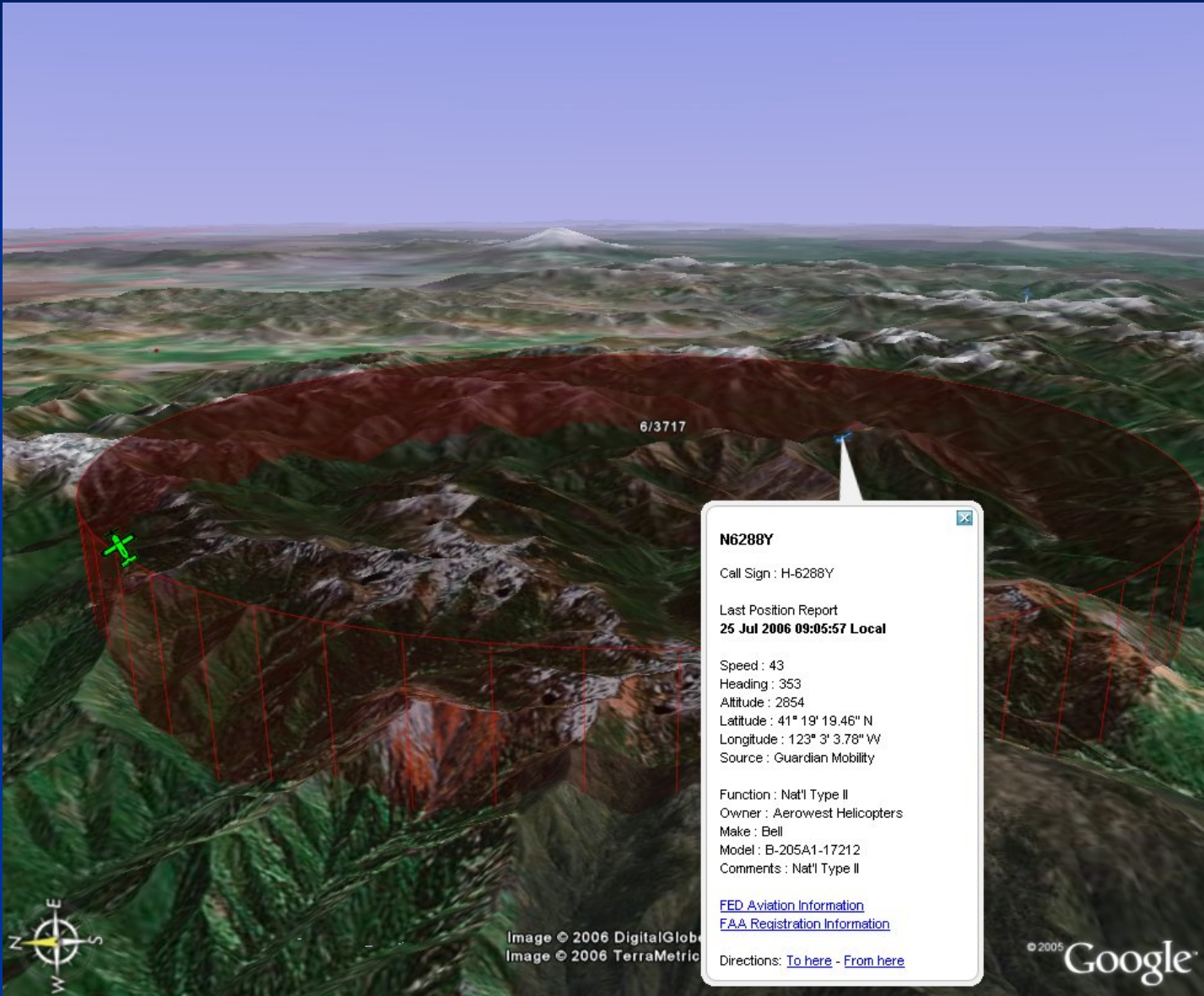
Fire Traffic Area around TFR



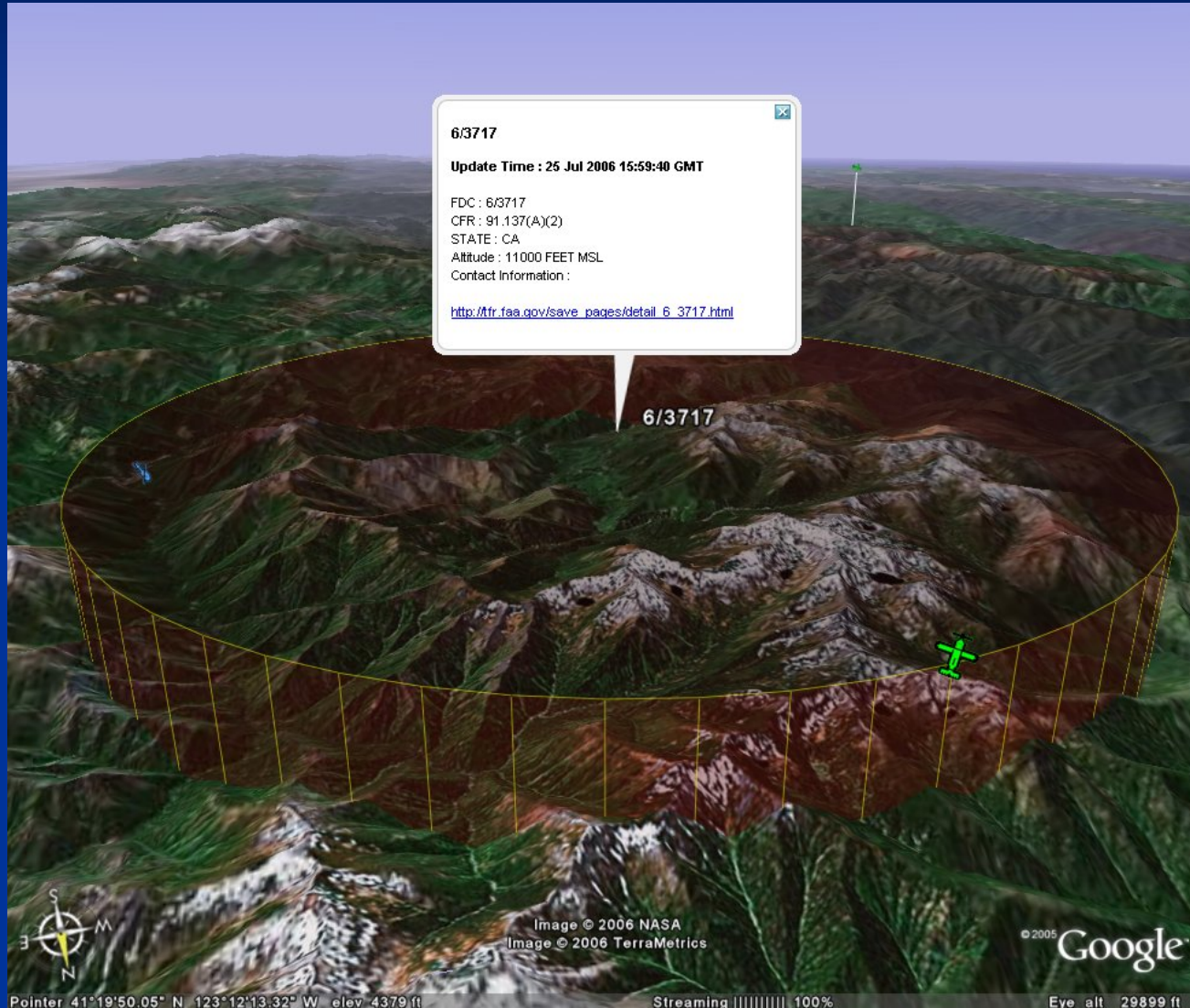
Tracking Fire Resources



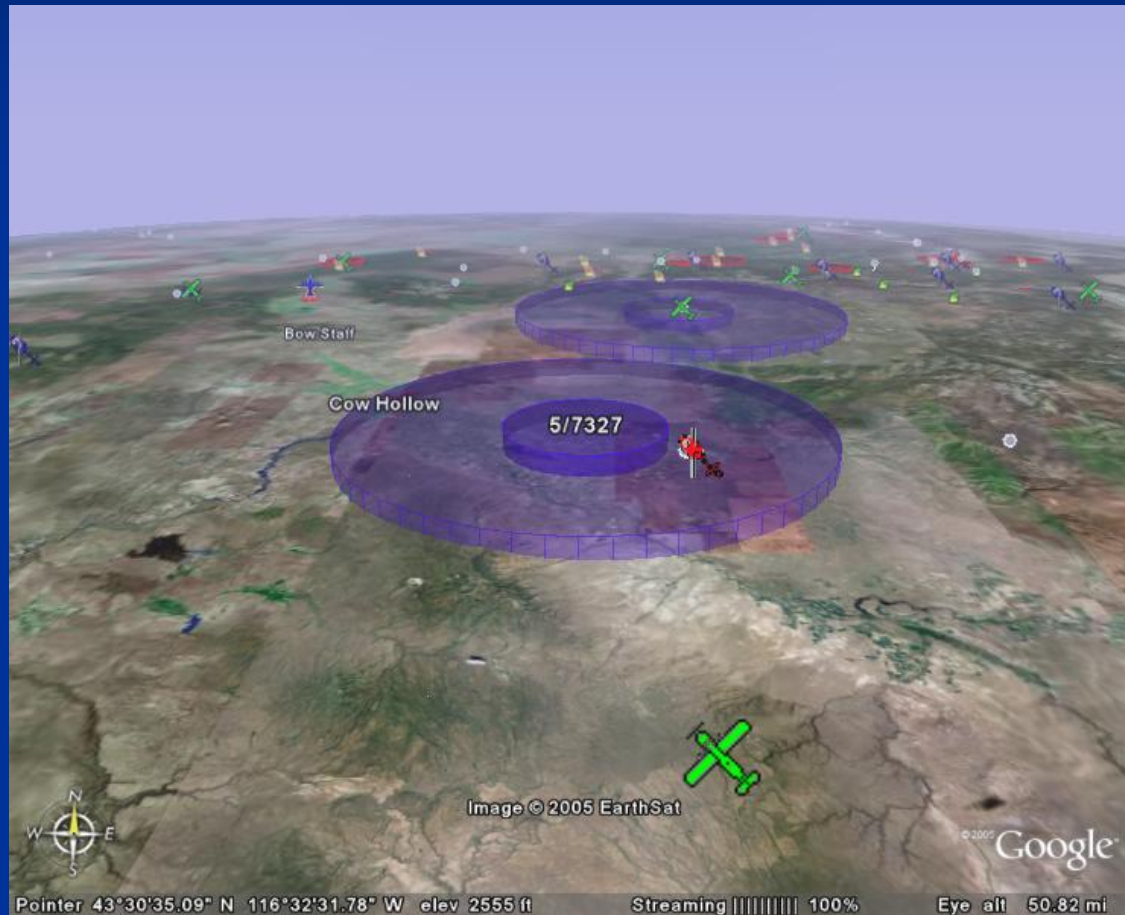
Position Reports



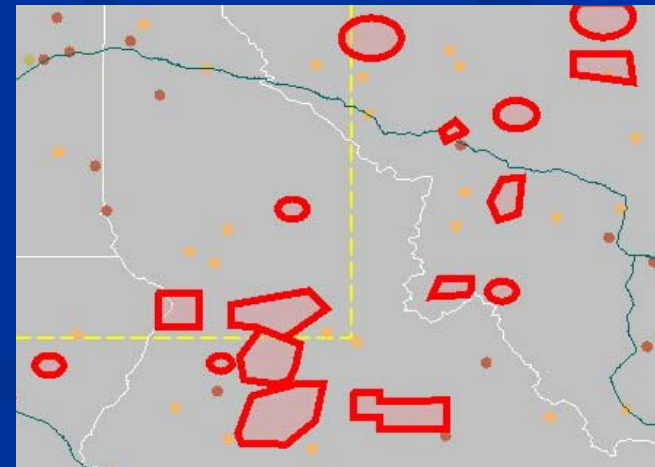
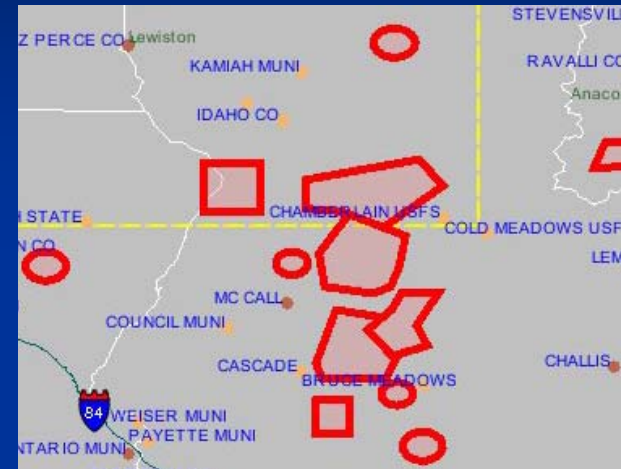
TFR Information in 3D

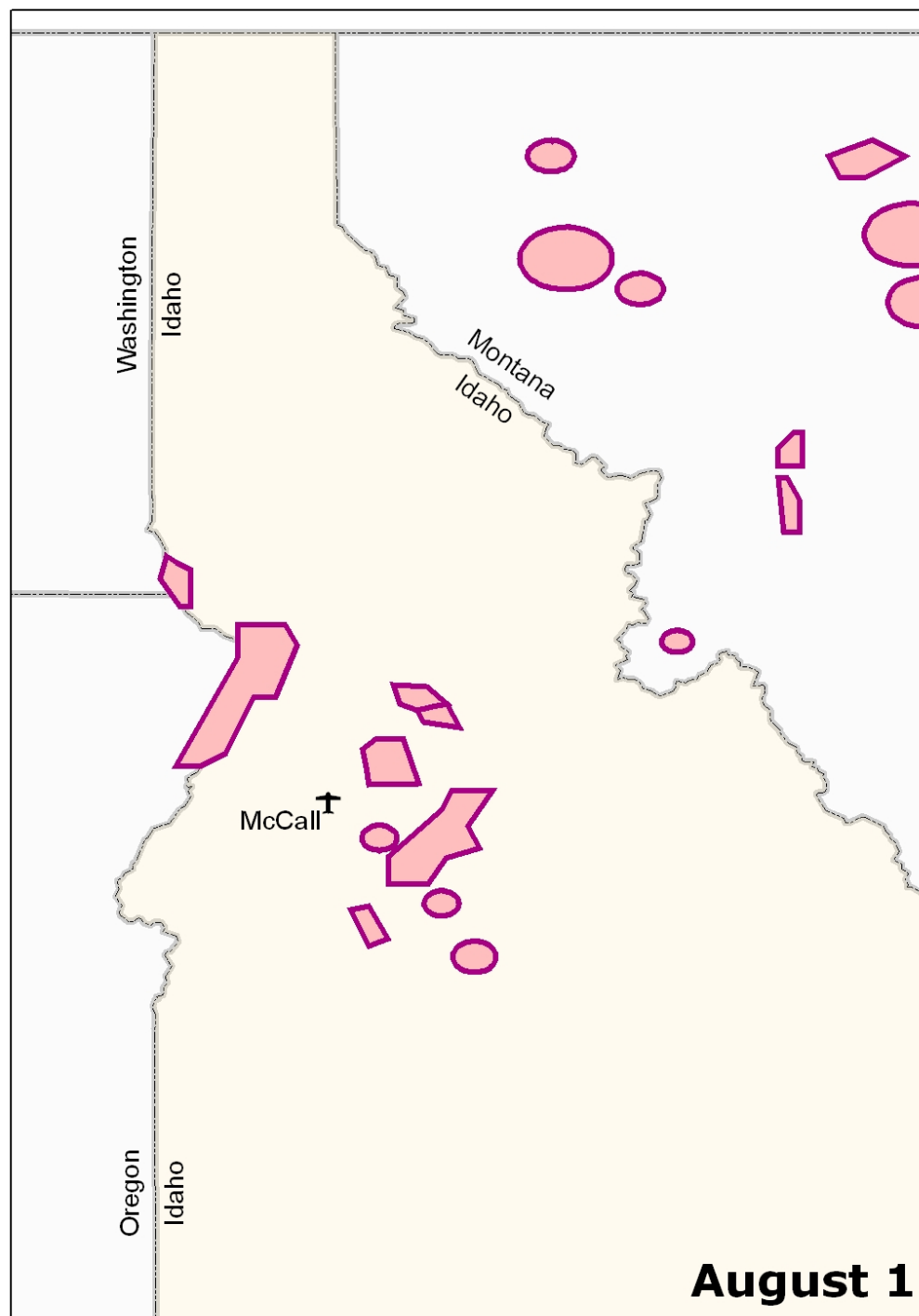


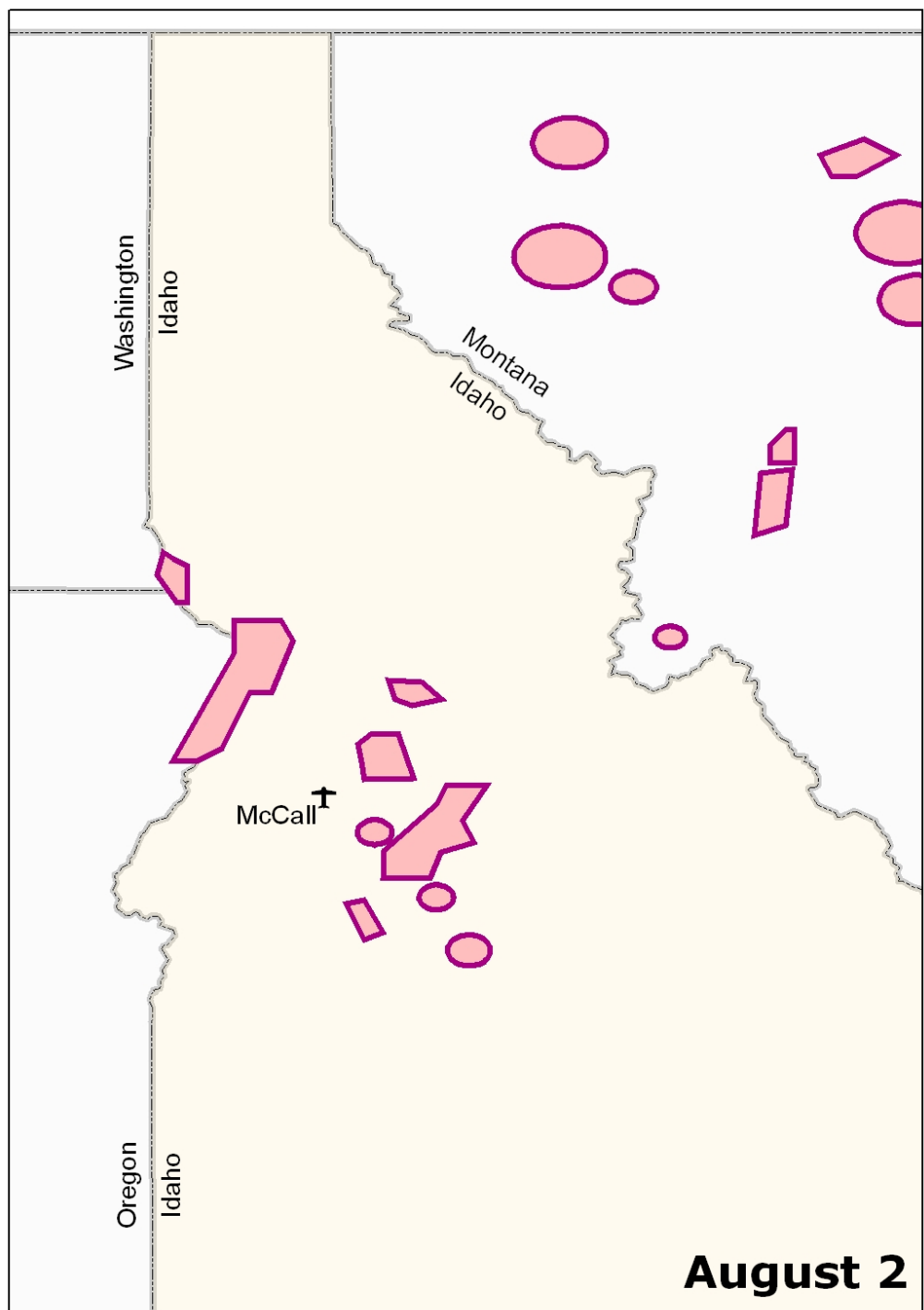
New Technology helps us coordinate Presidential TFRs

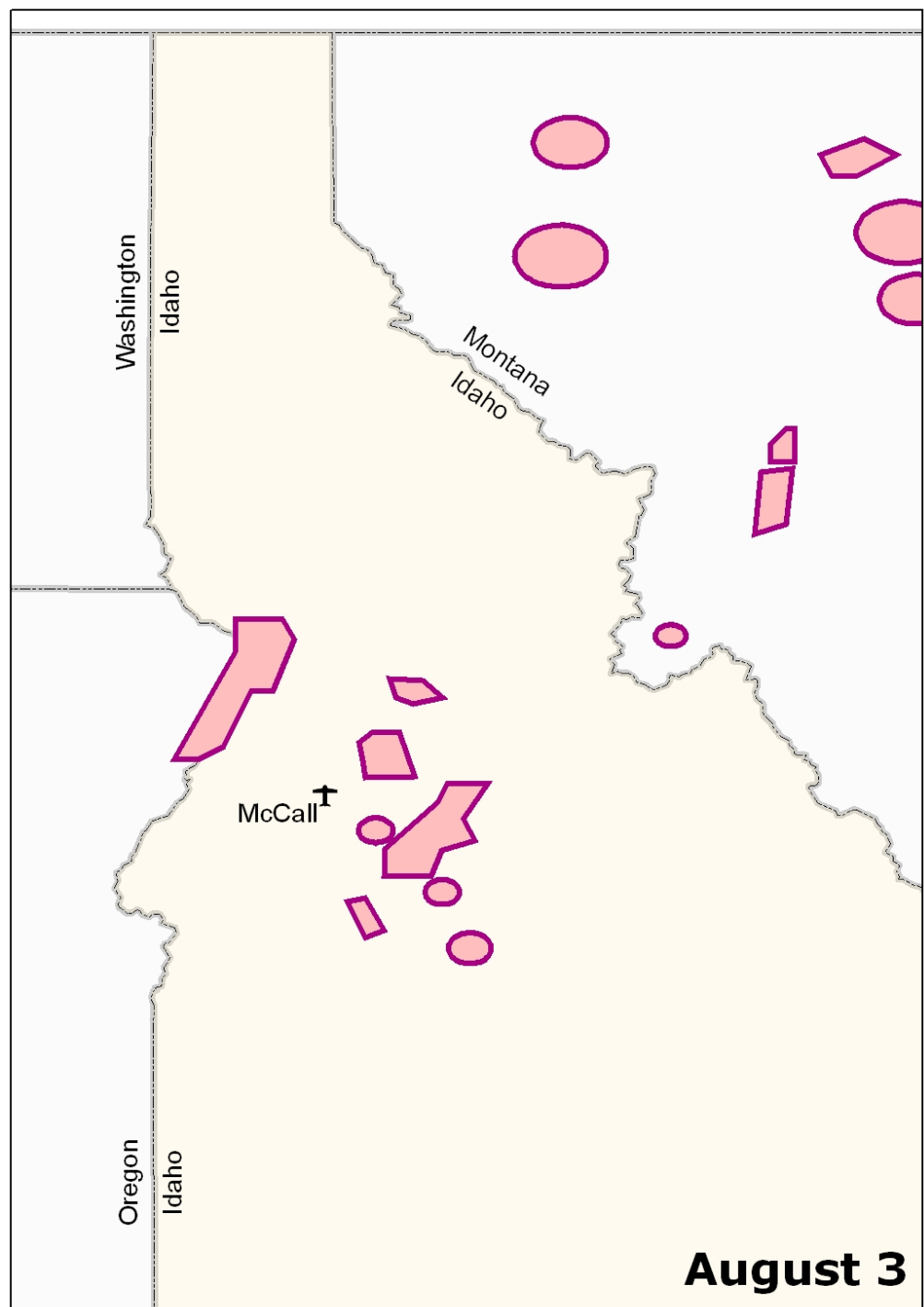


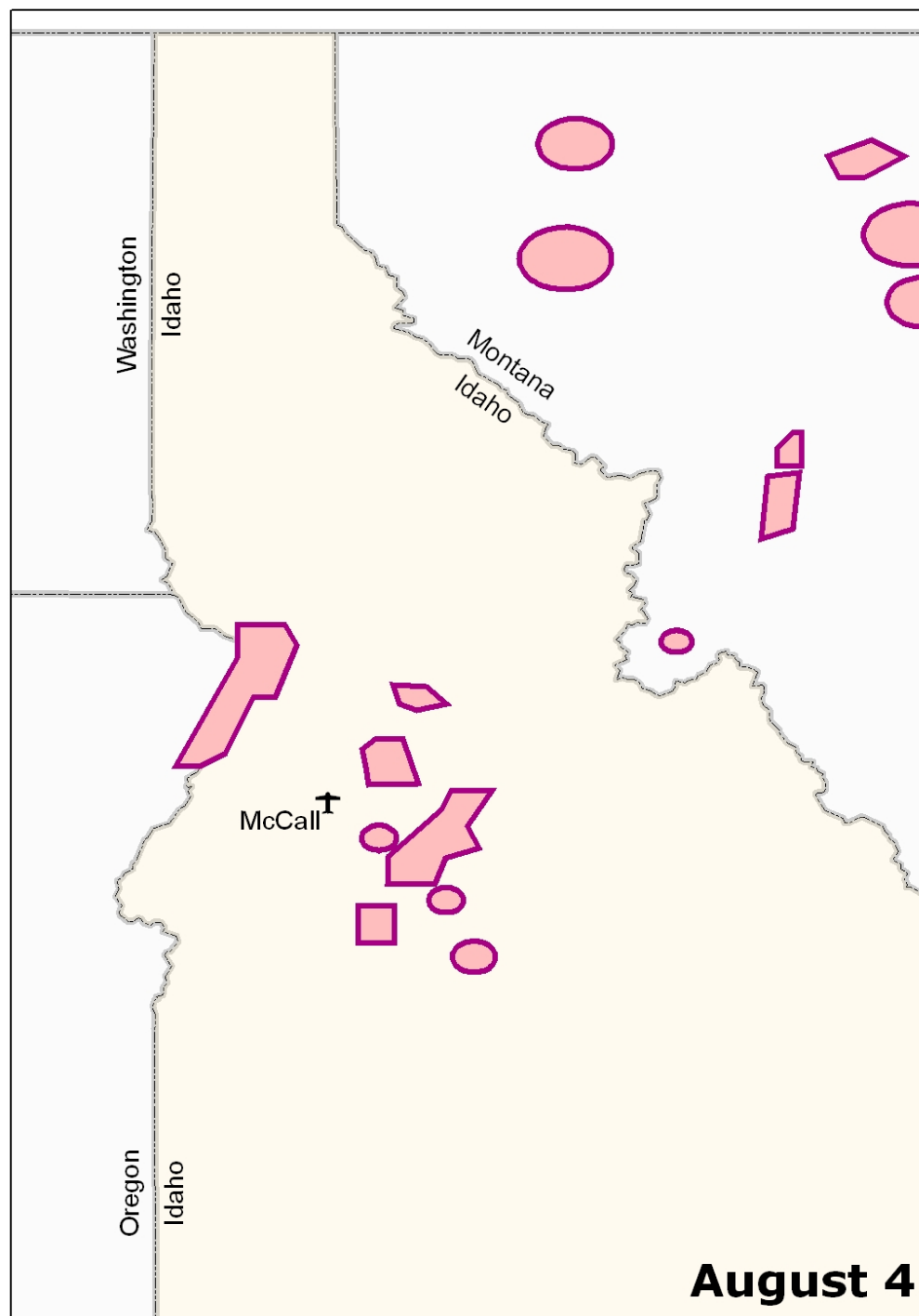
Tracking TFR Changes

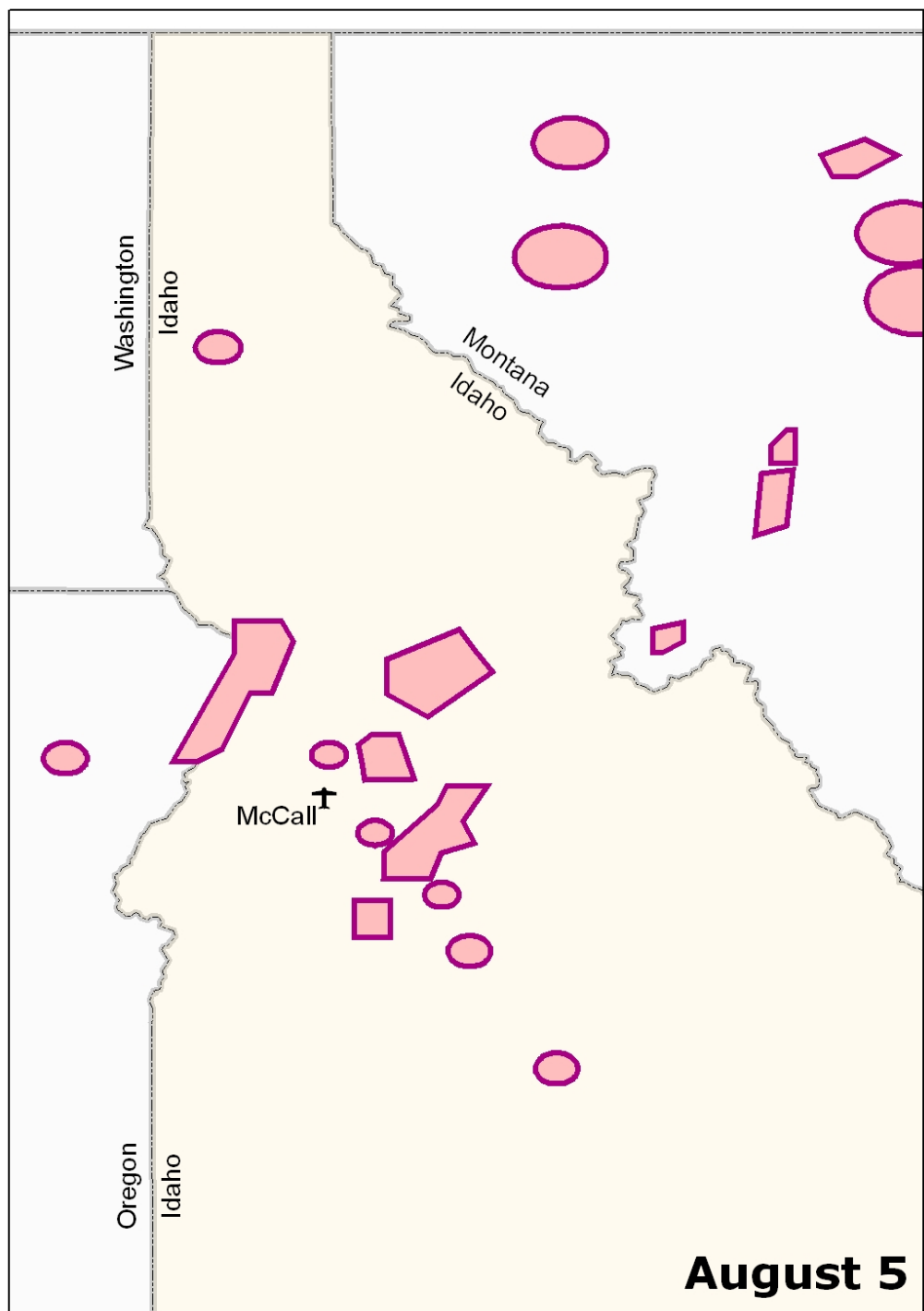


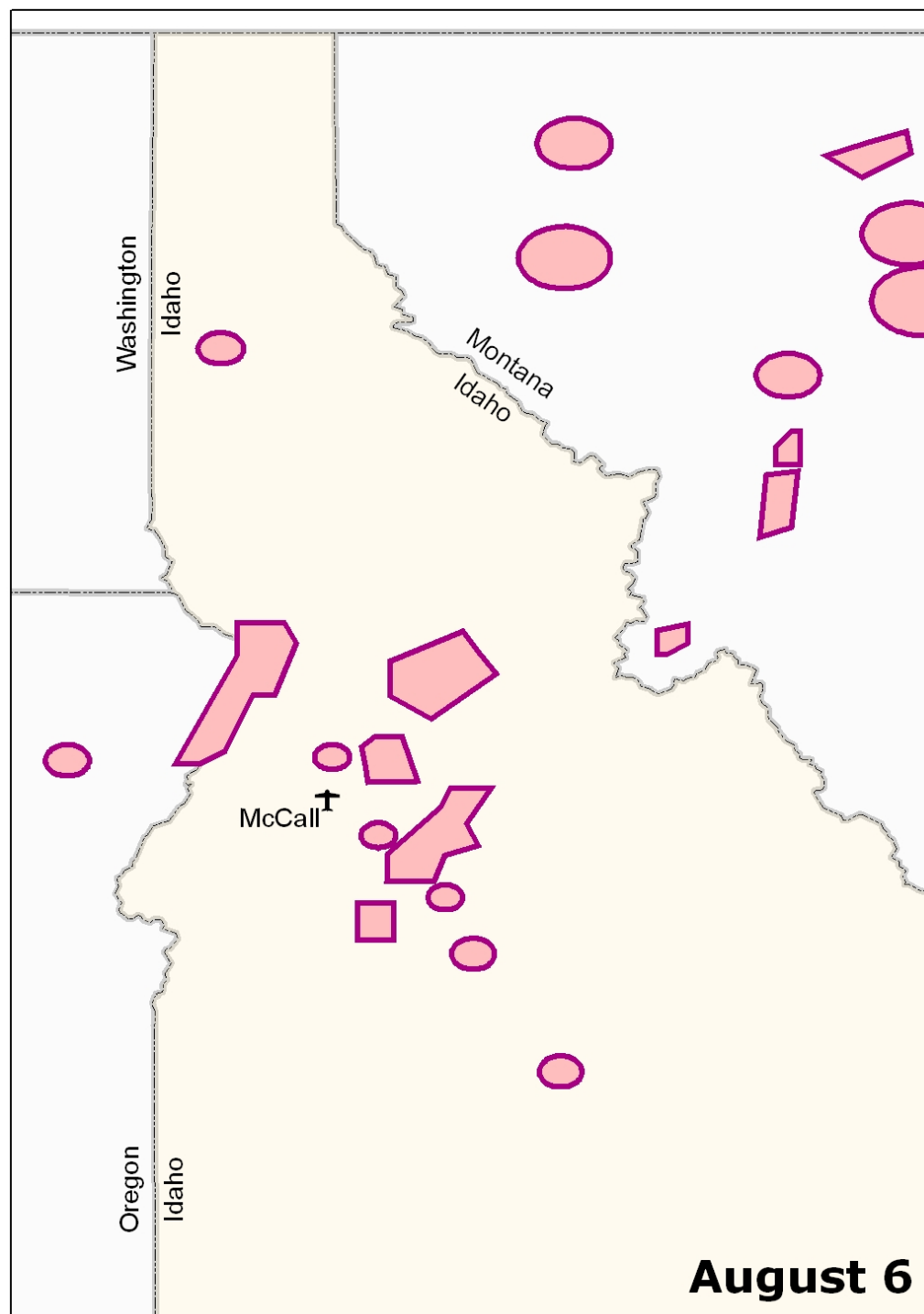


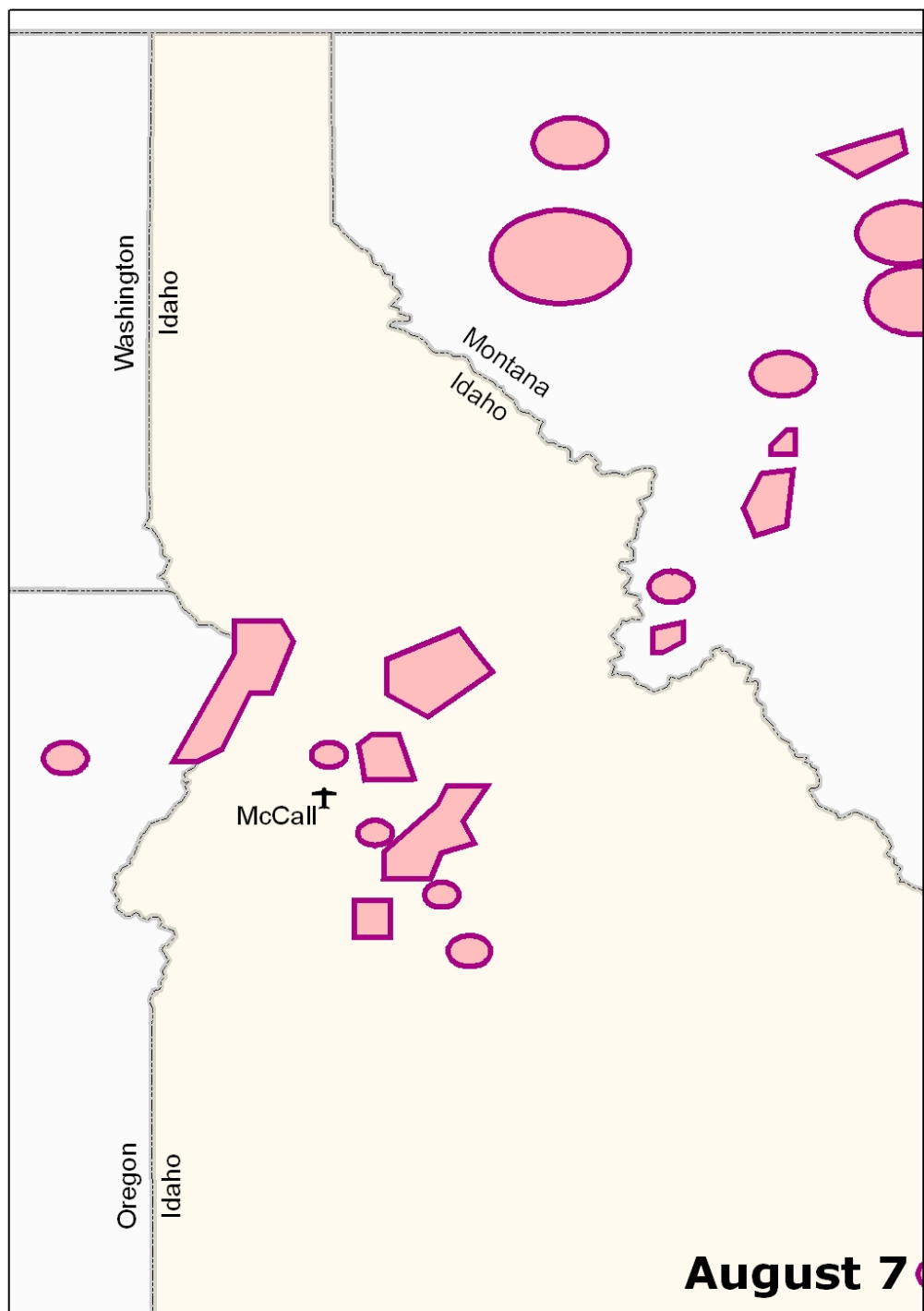


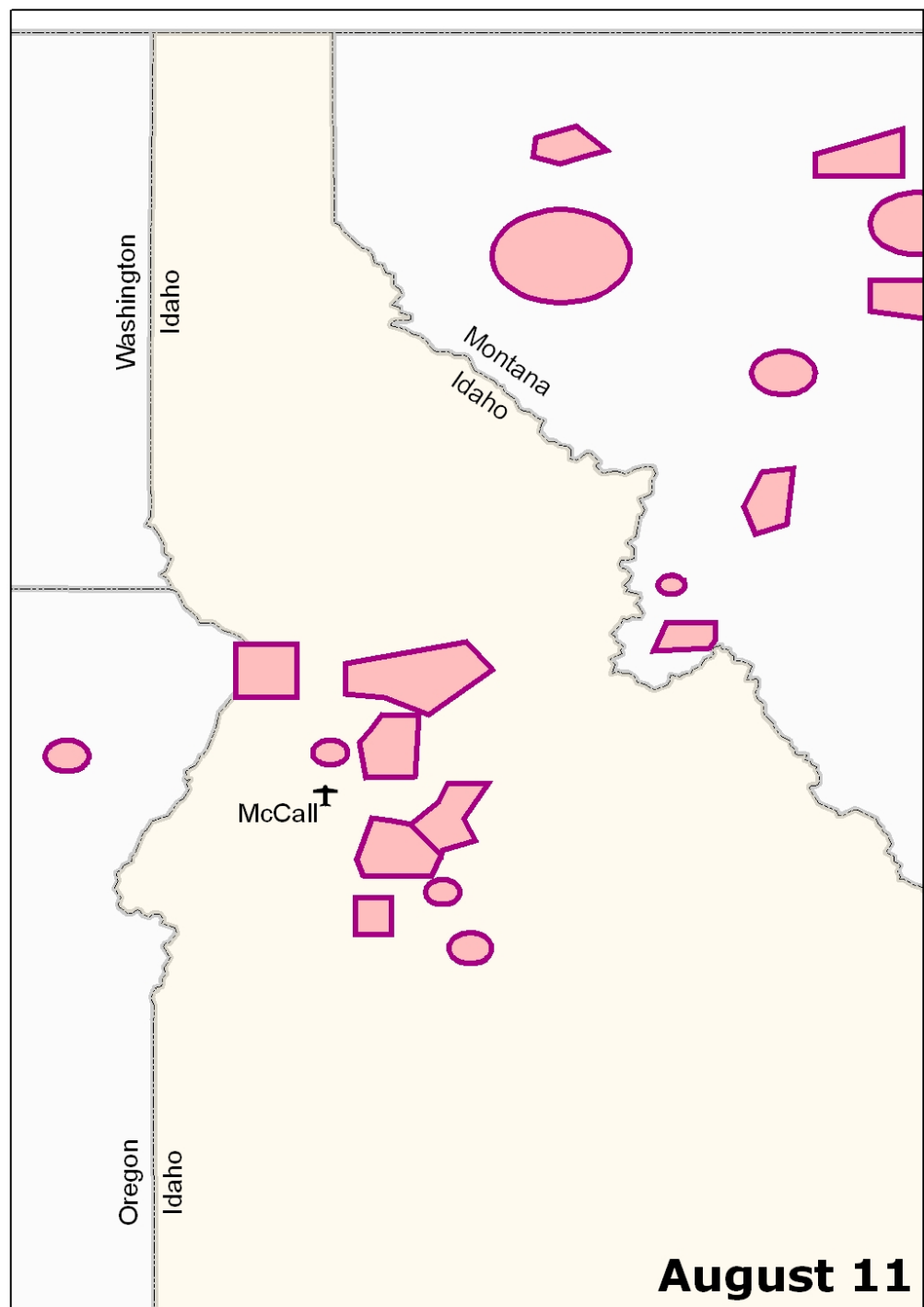


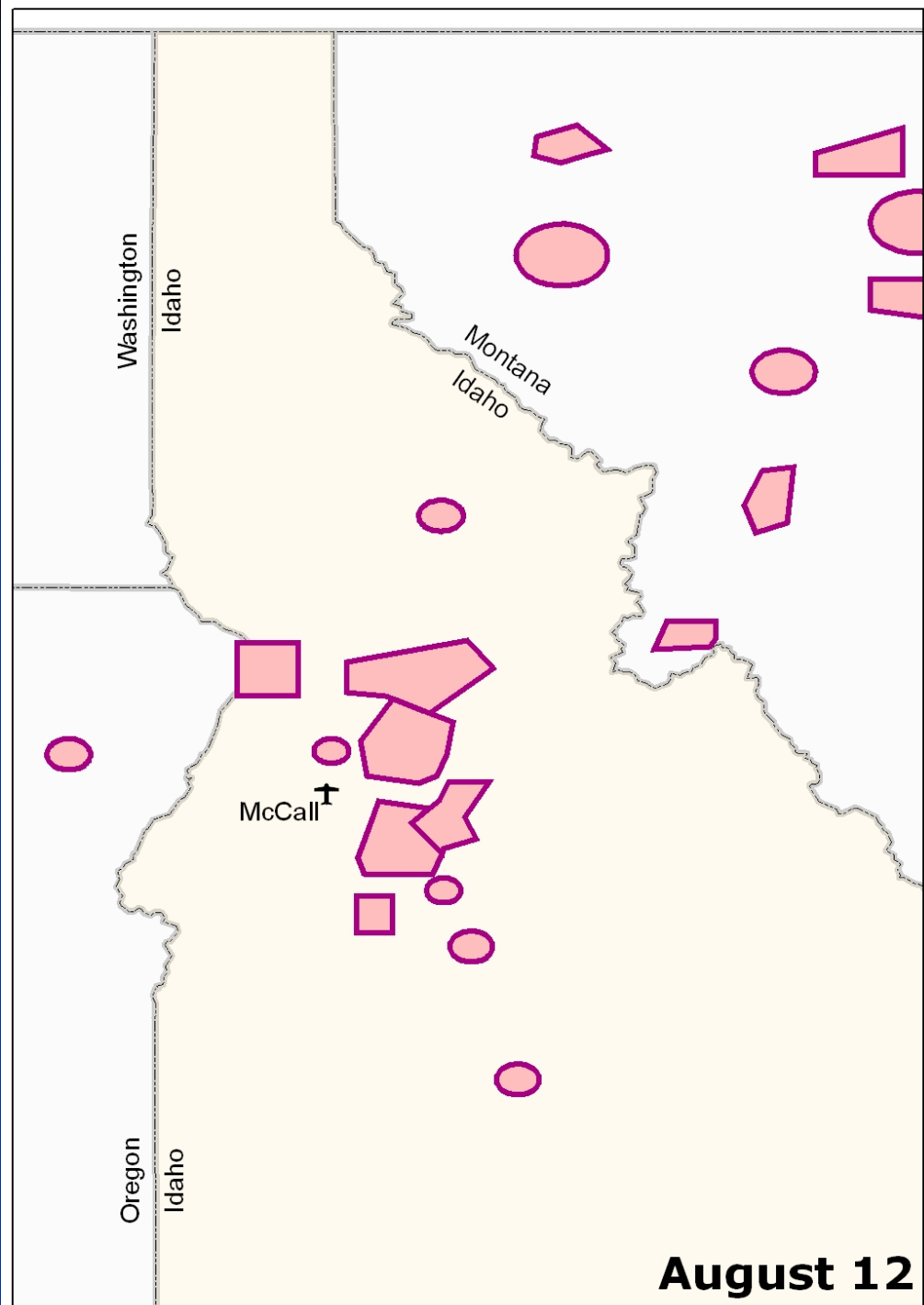


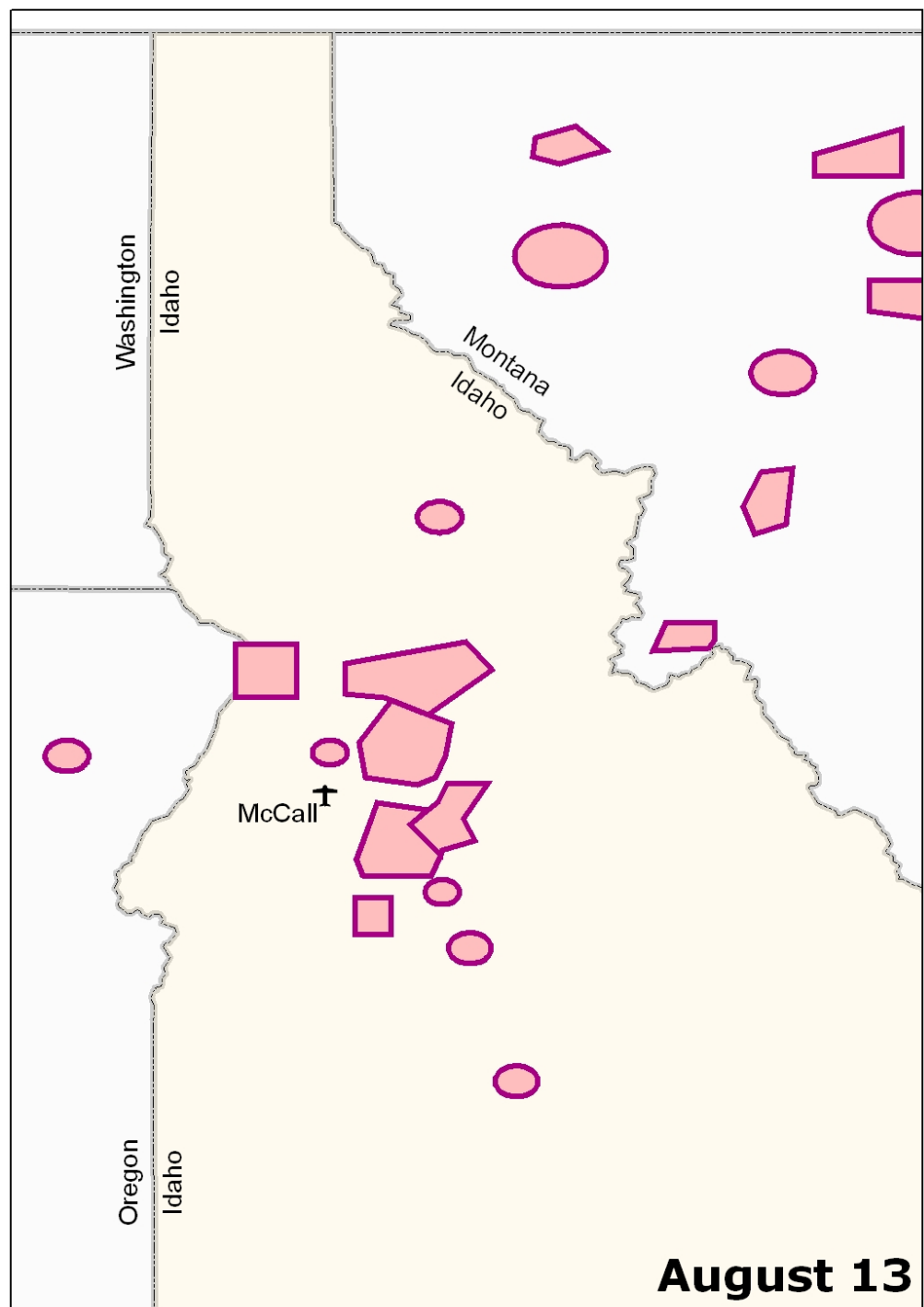


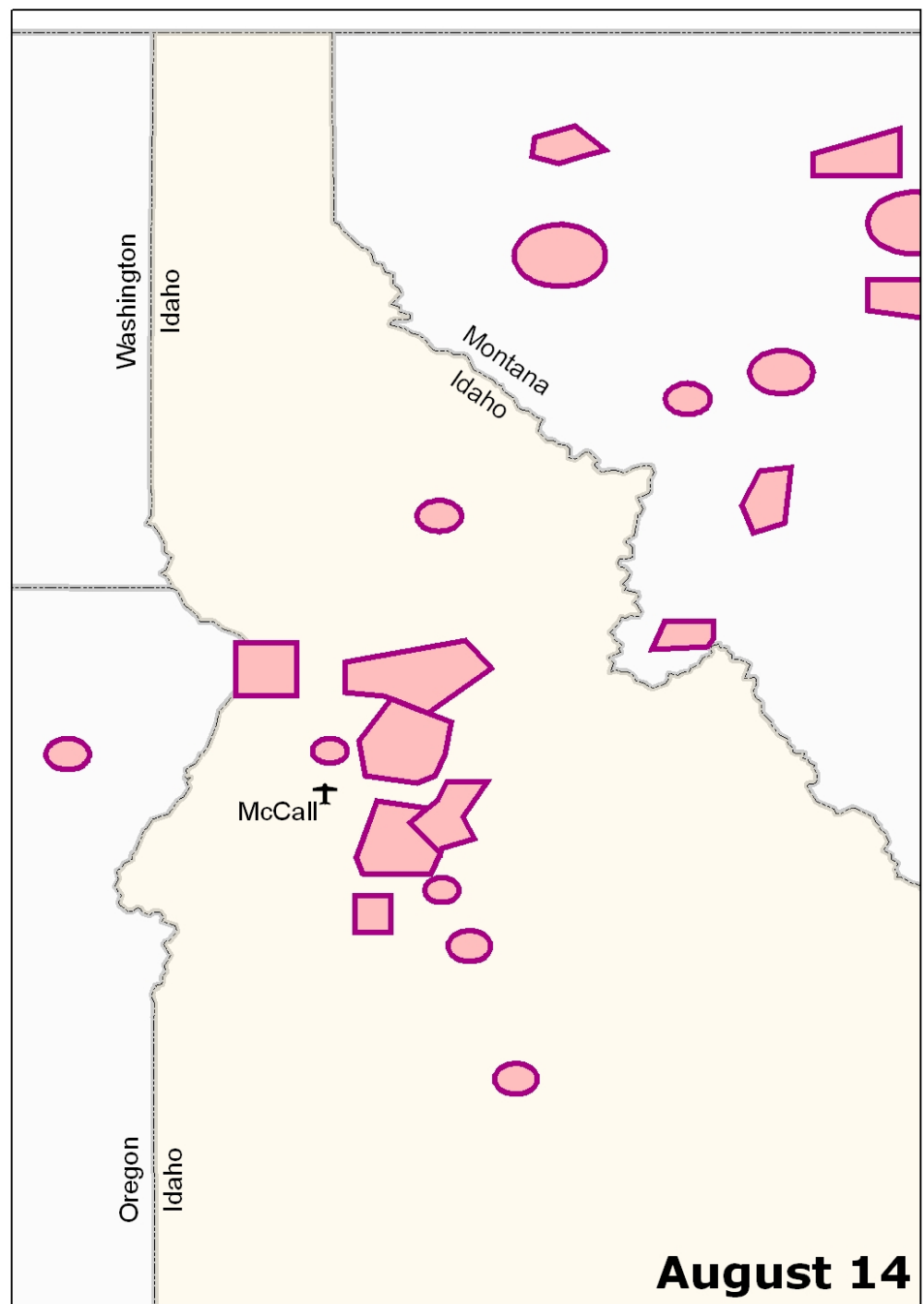


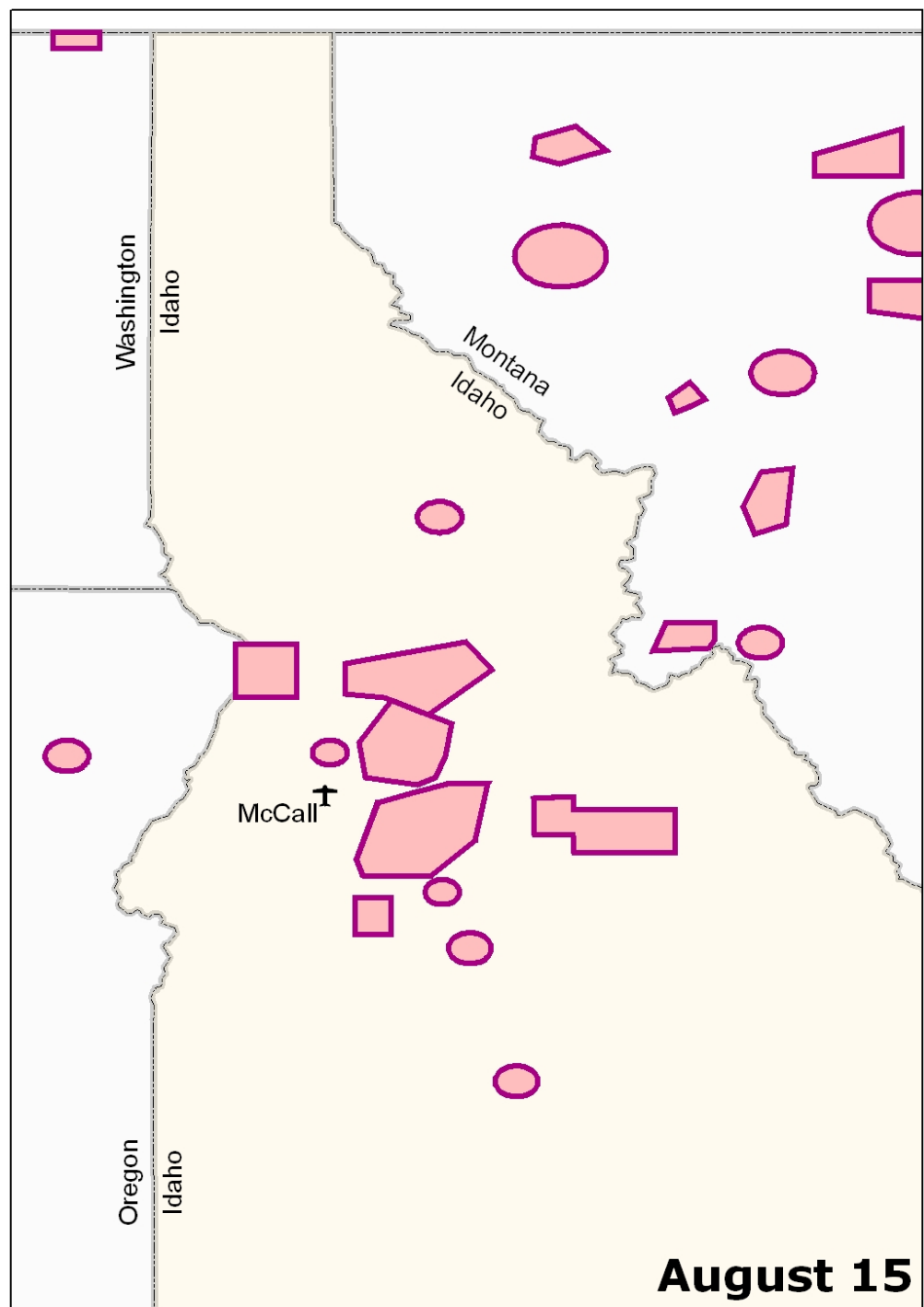


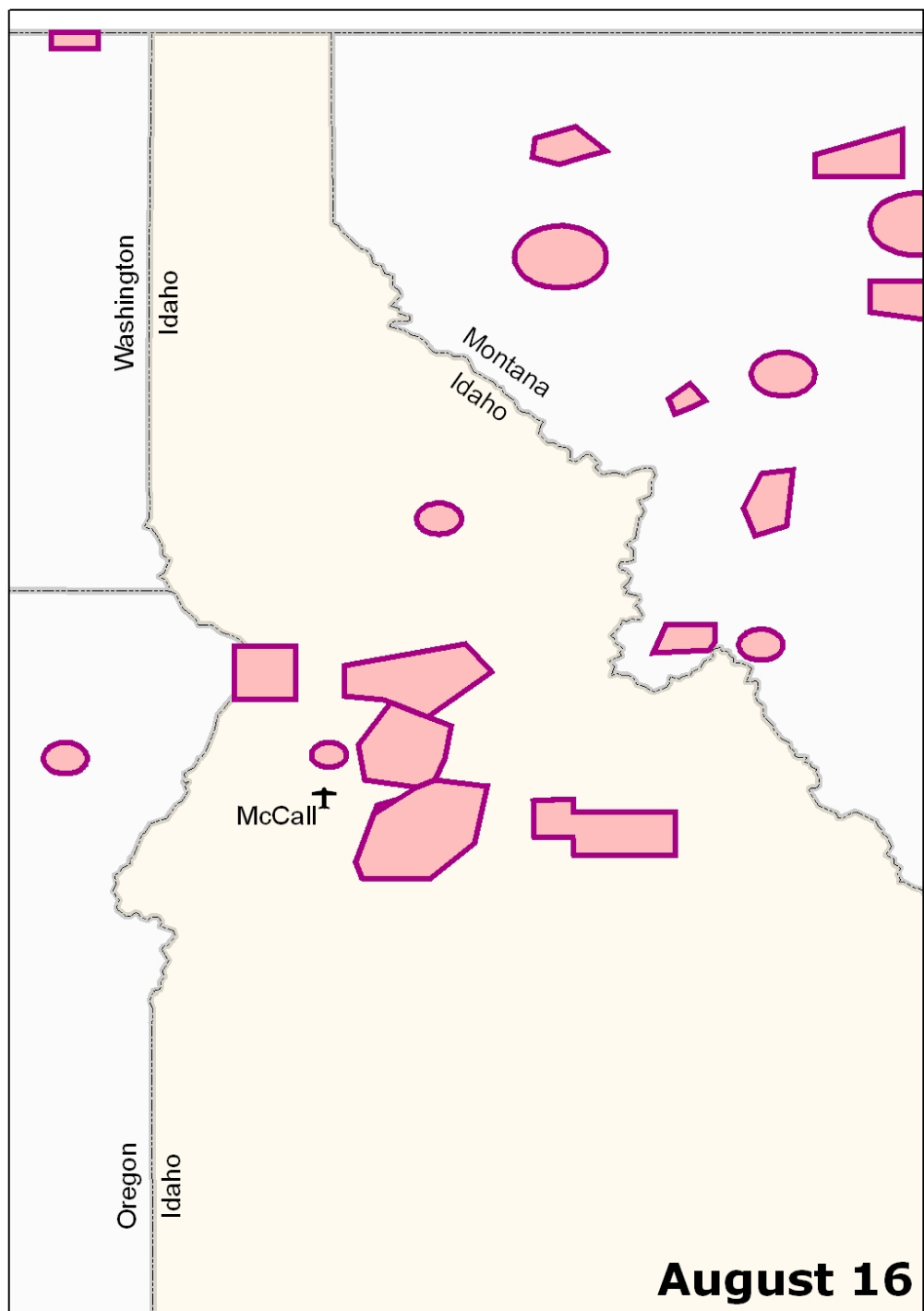


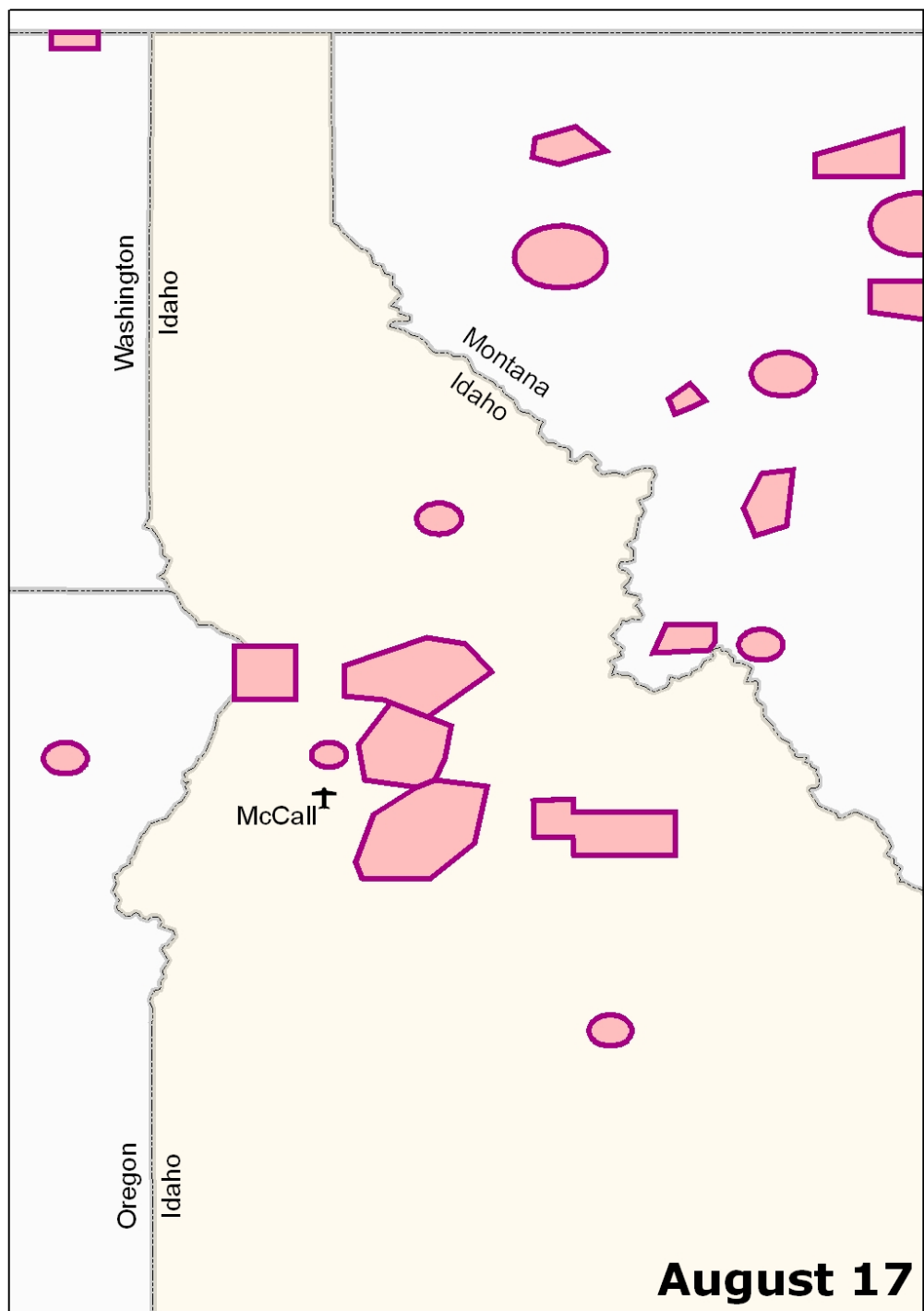


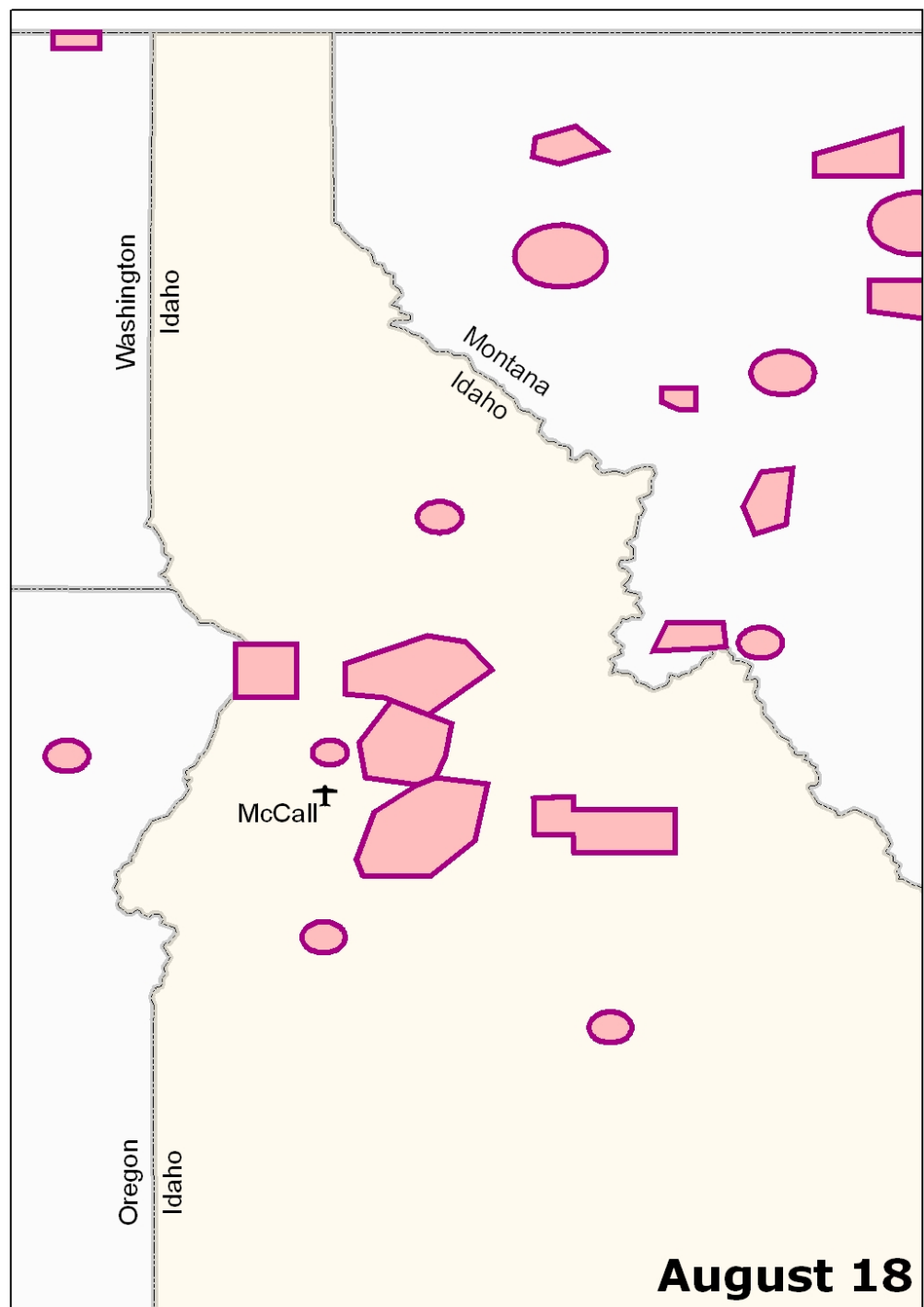


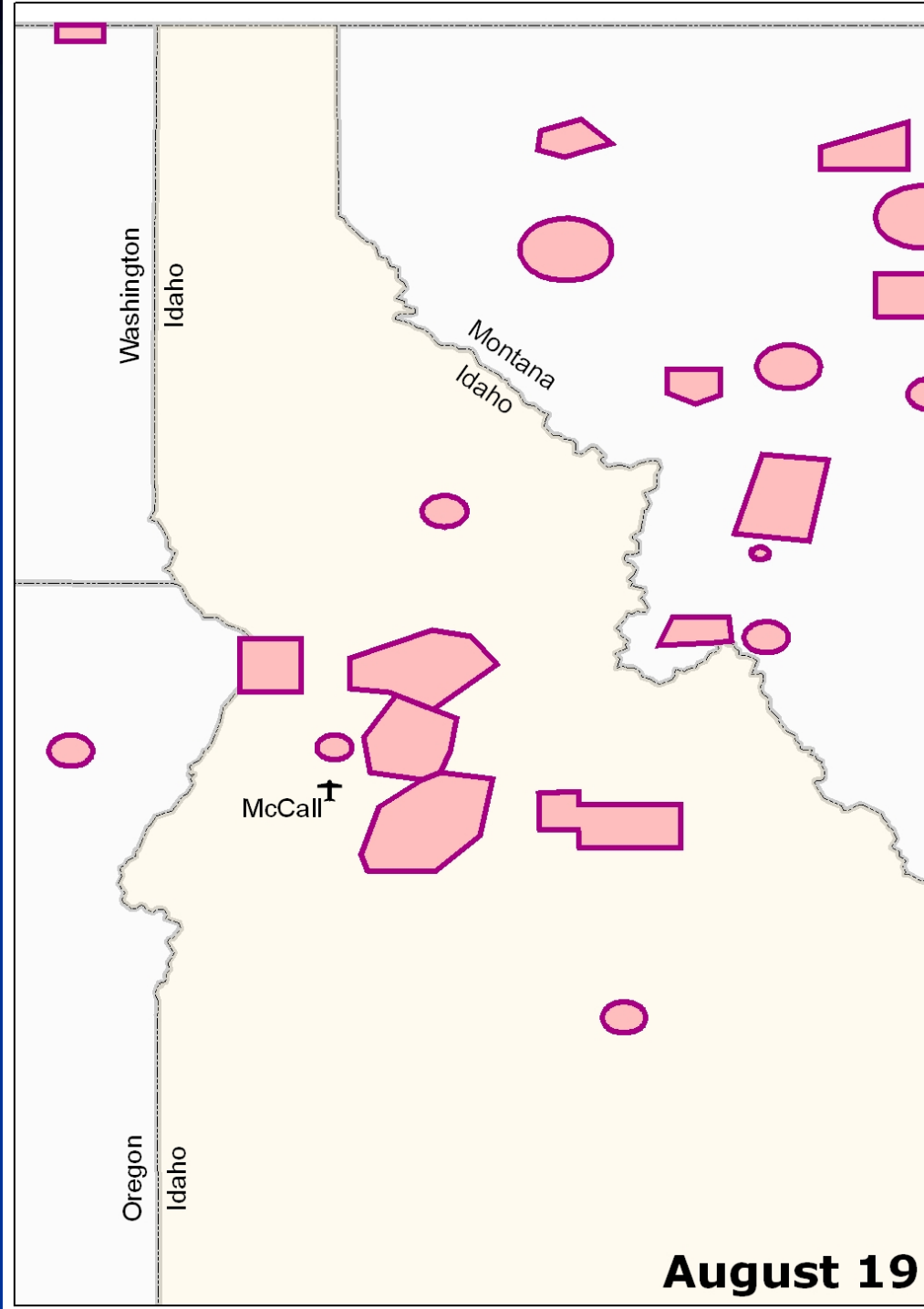


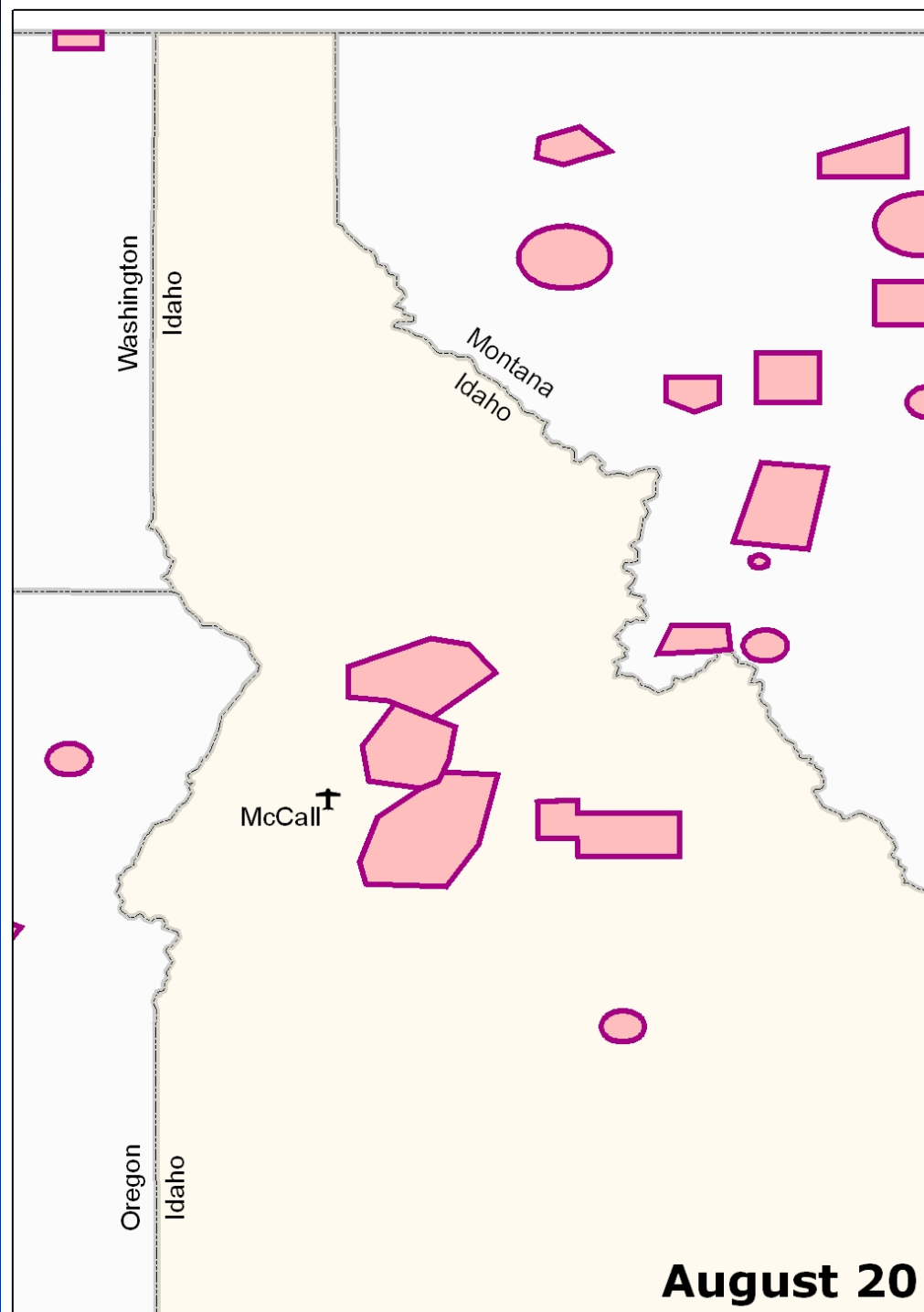


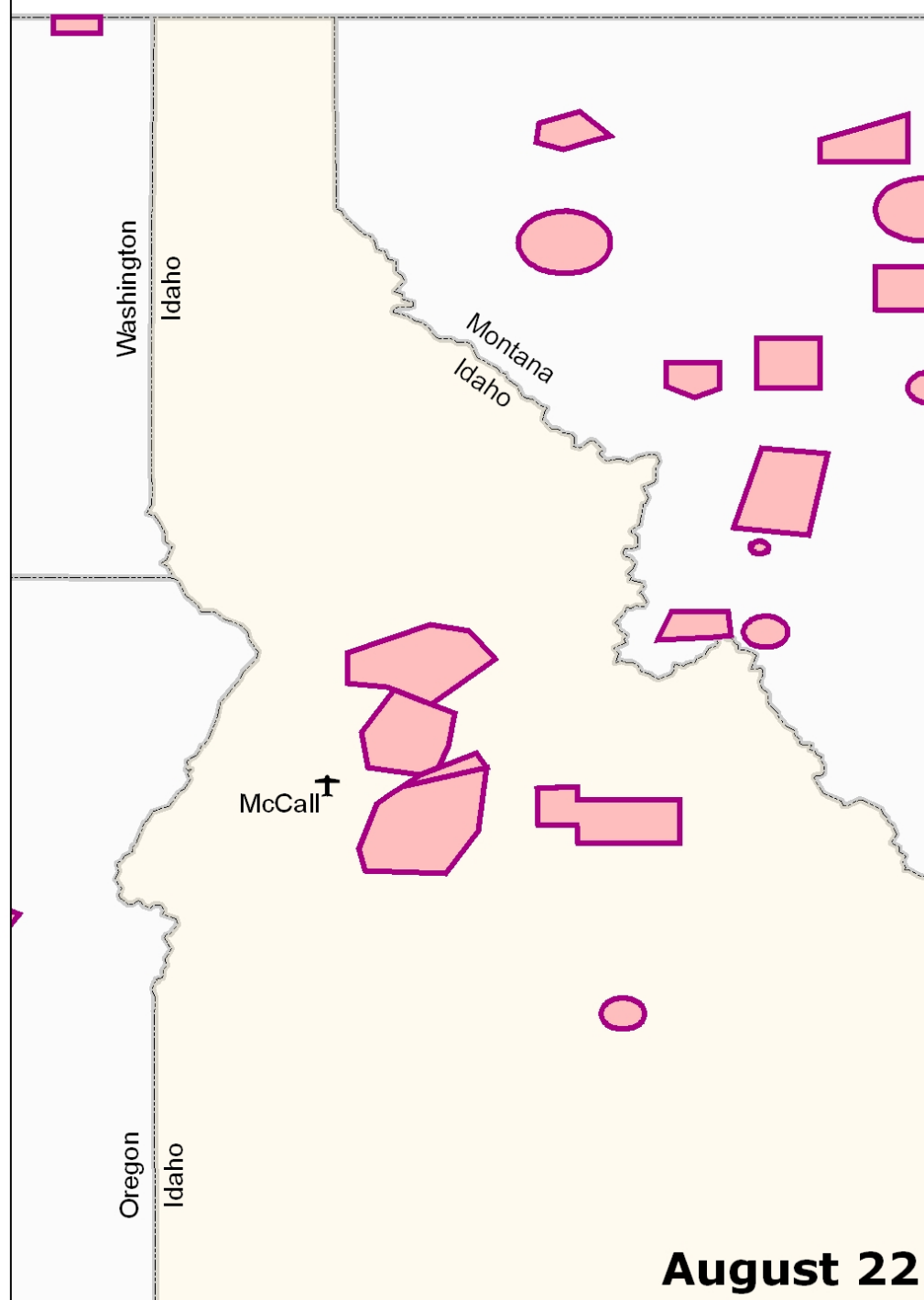


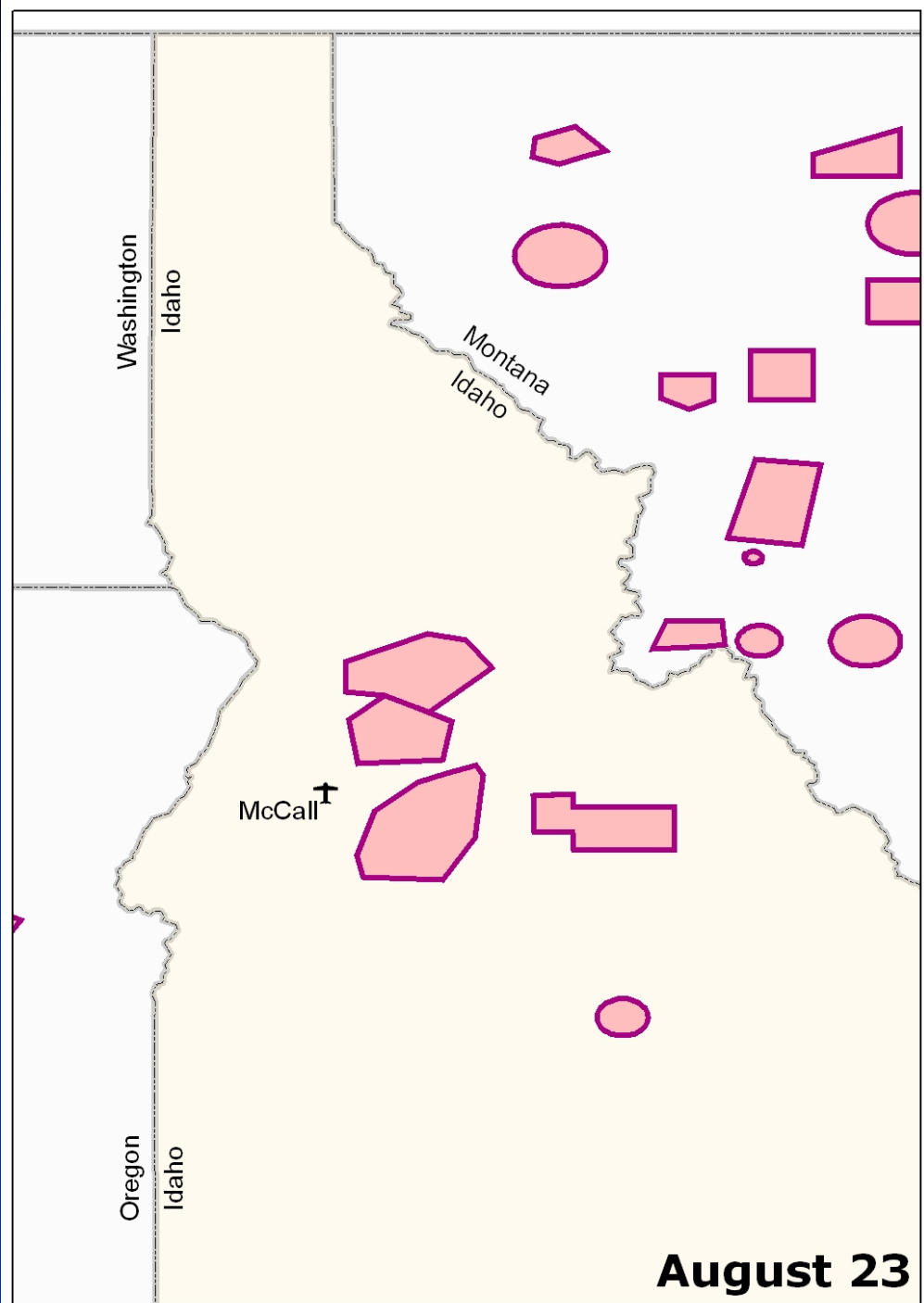


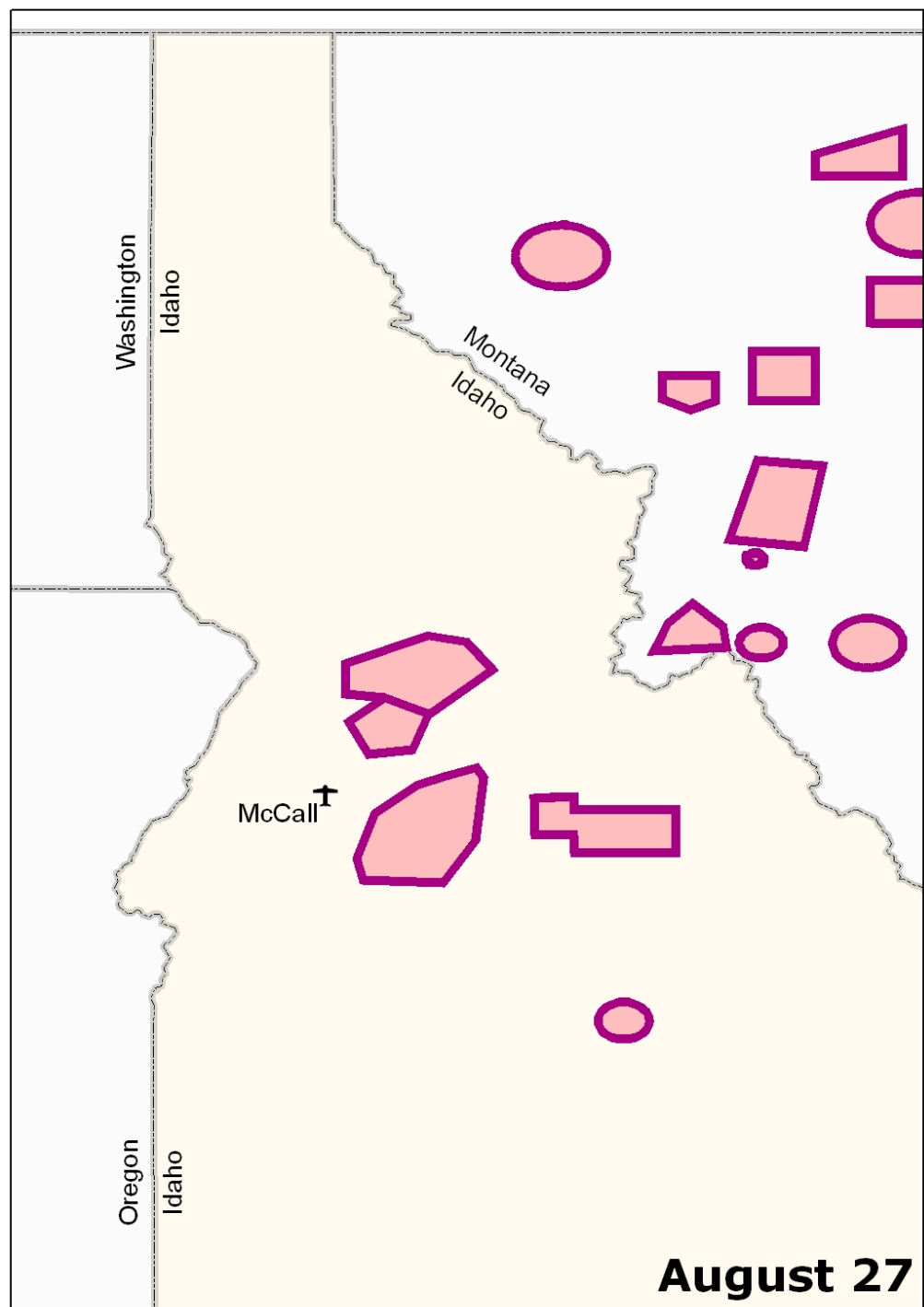


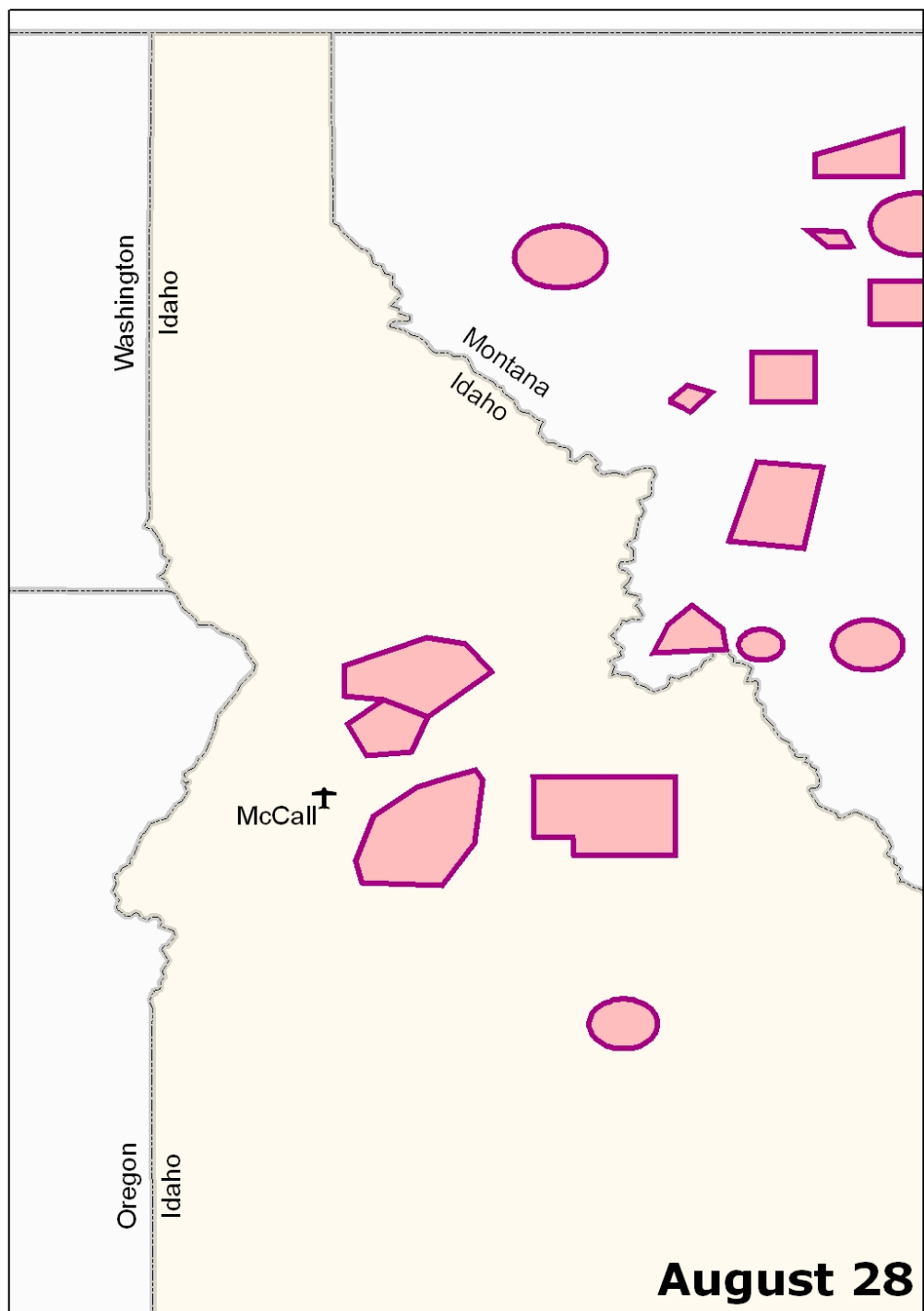


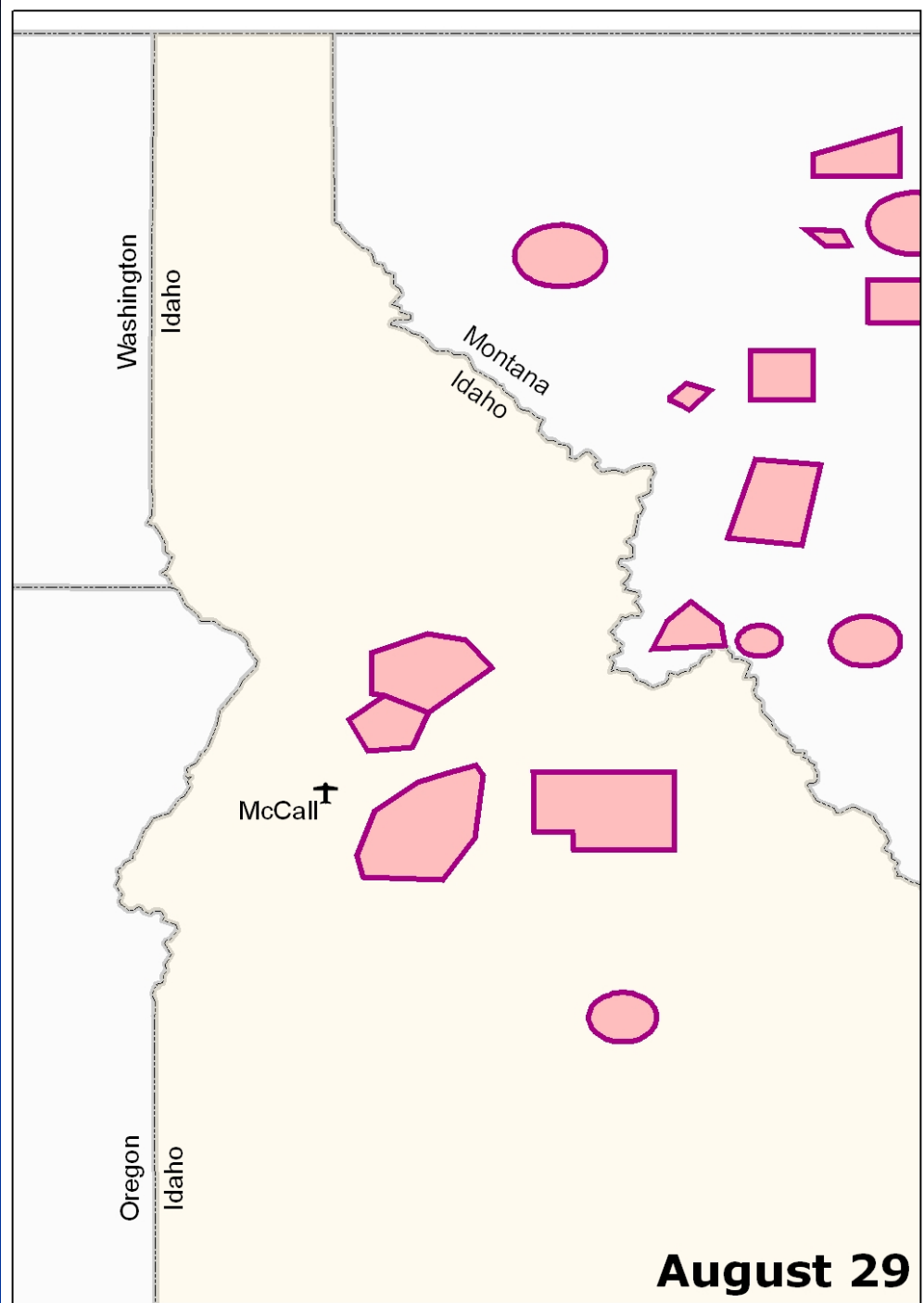




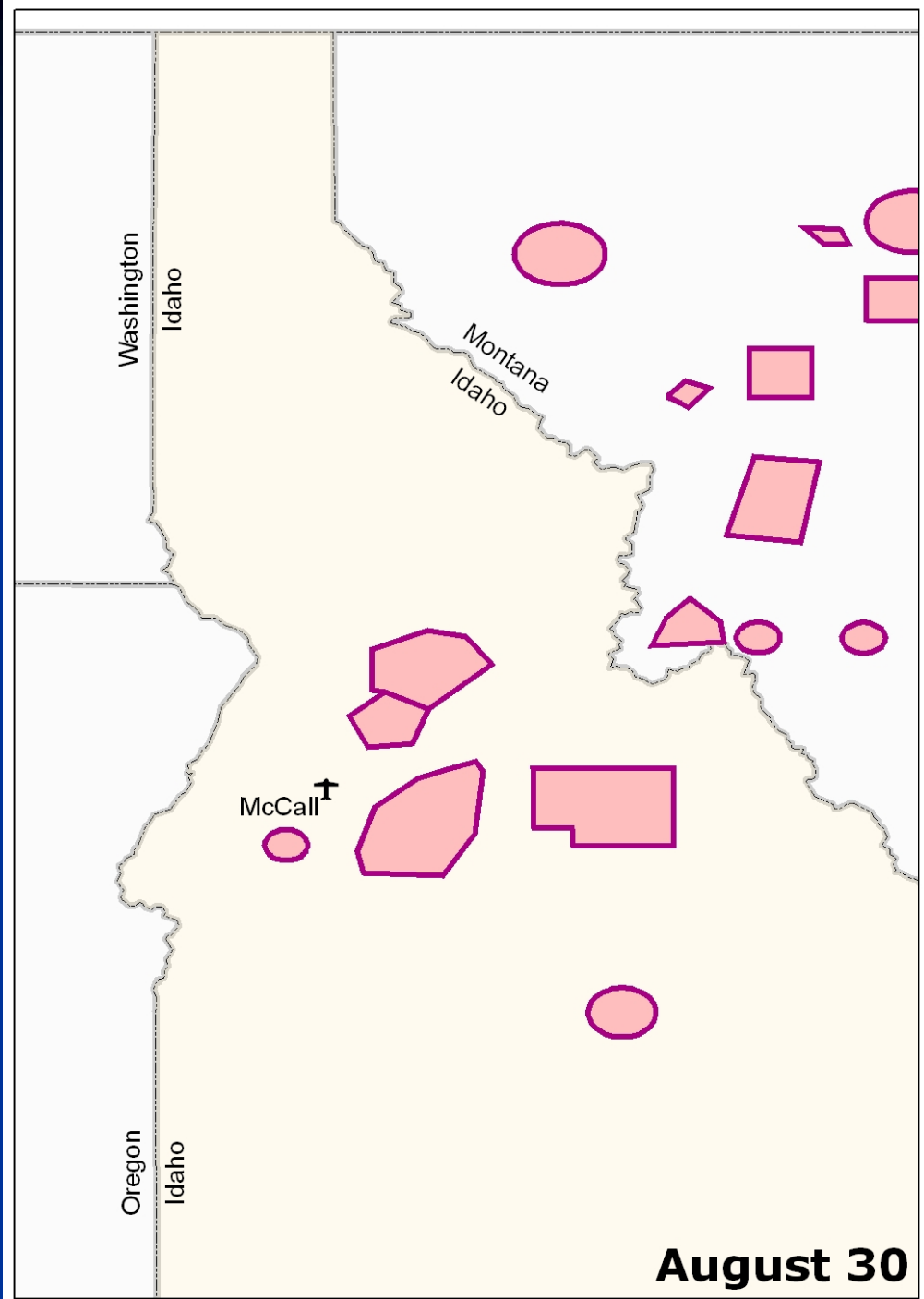


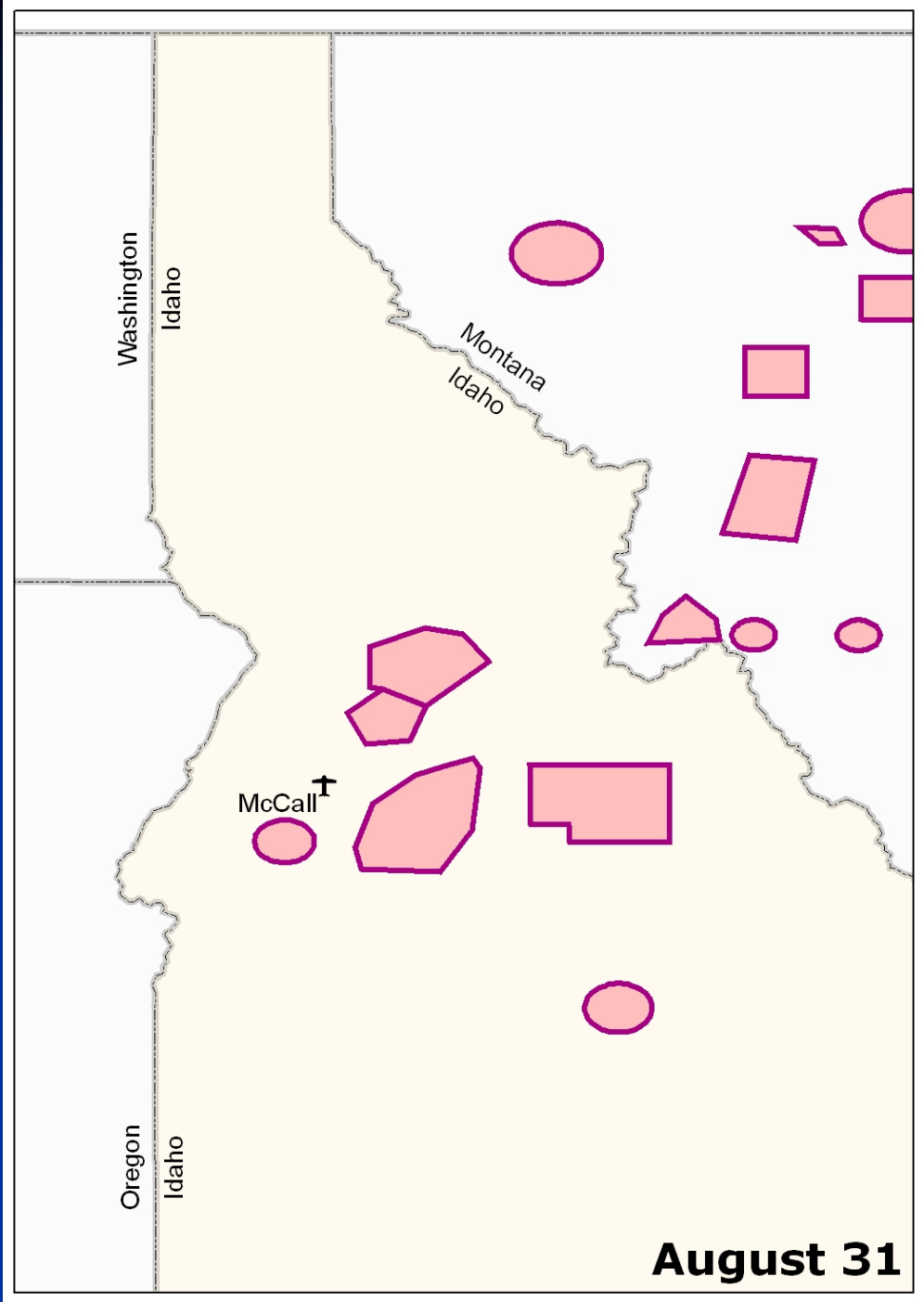


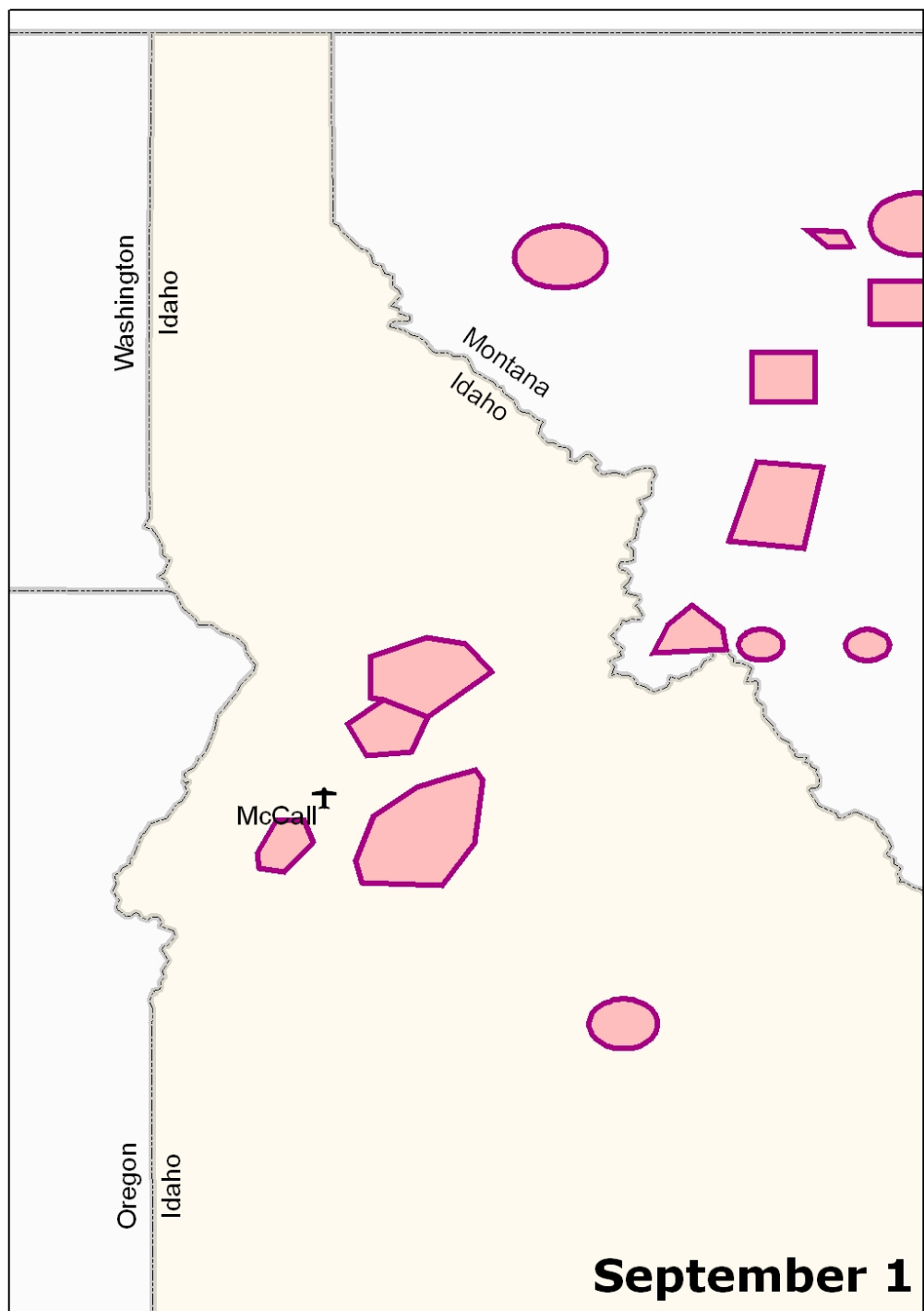


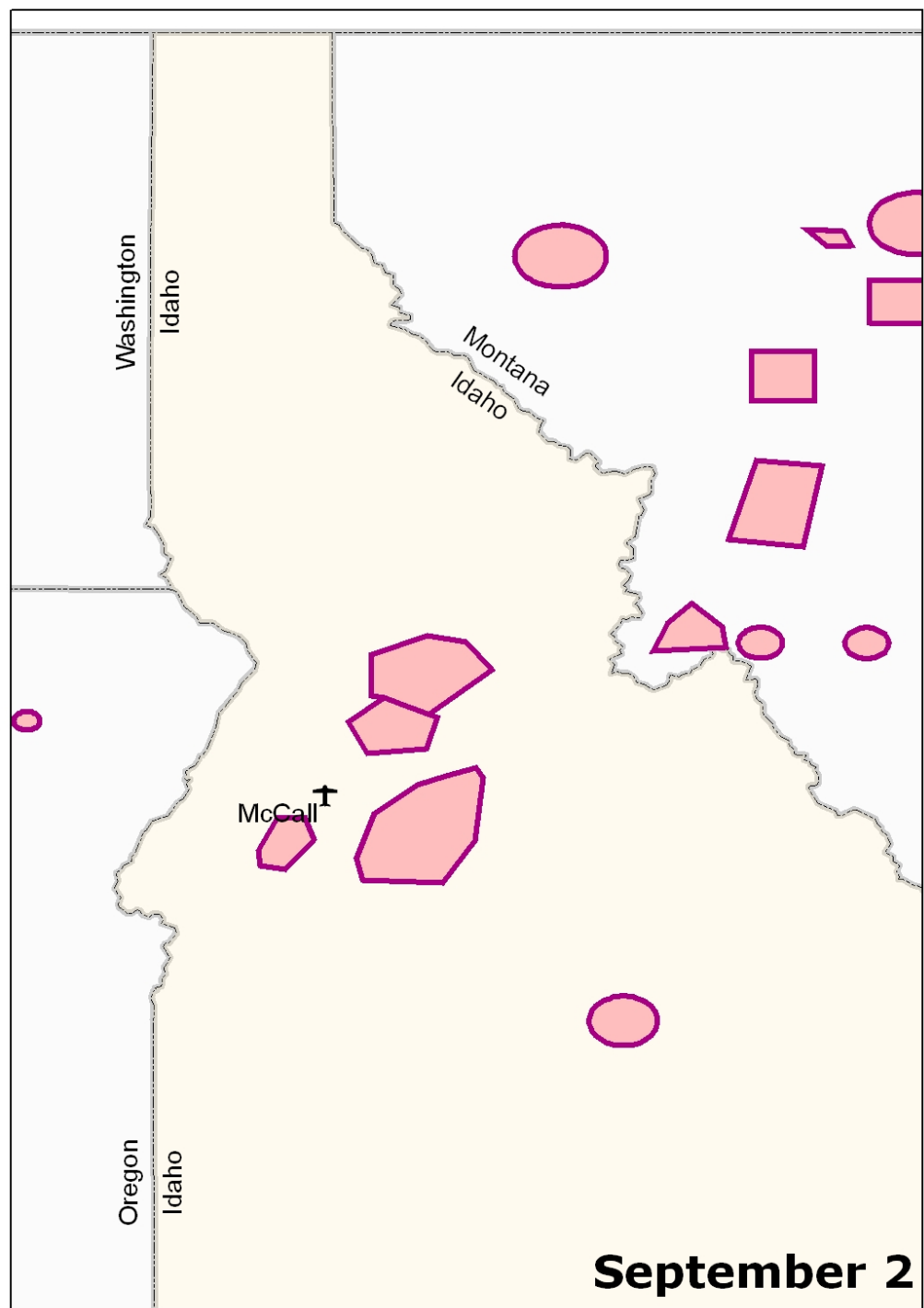


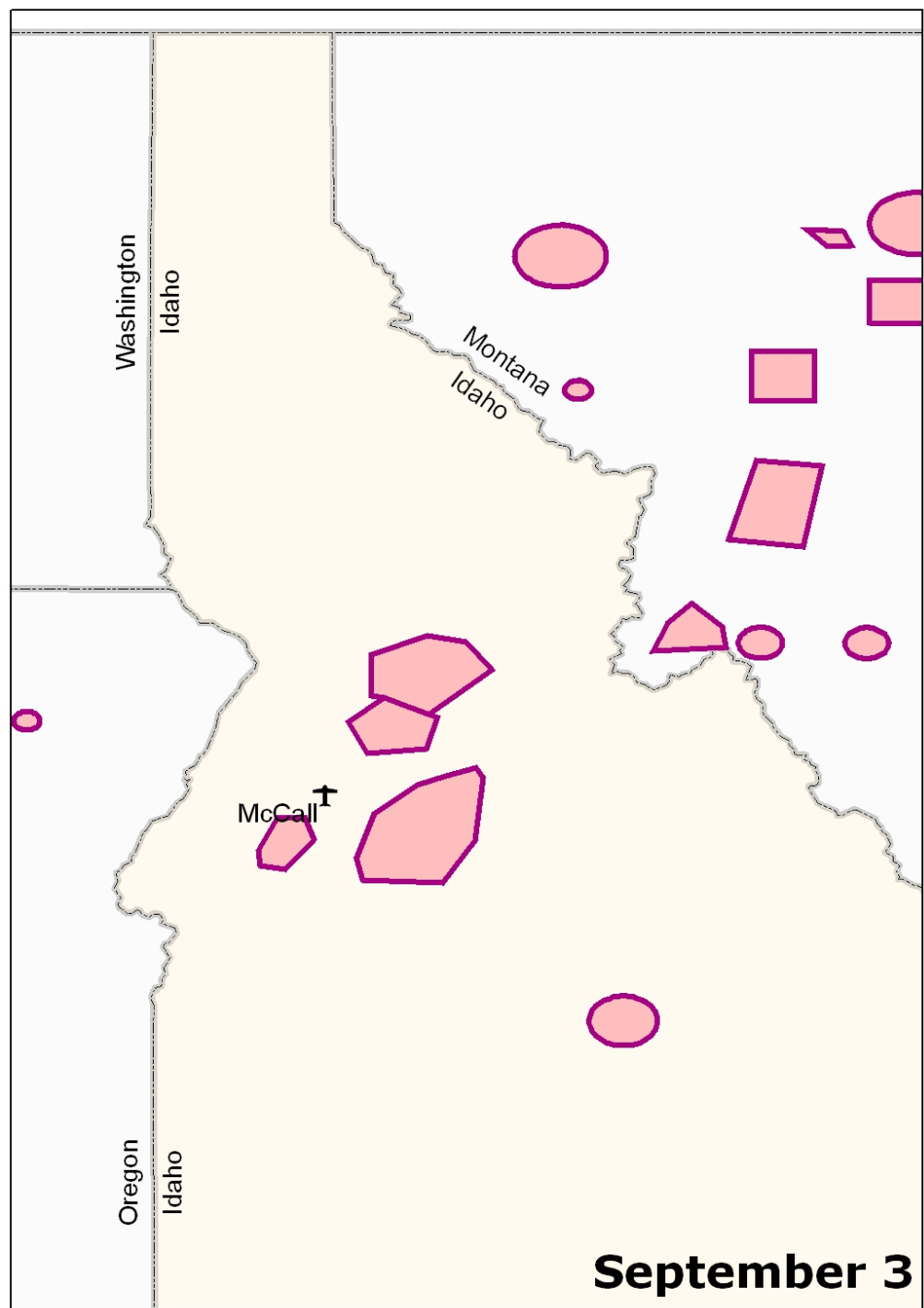
August 29

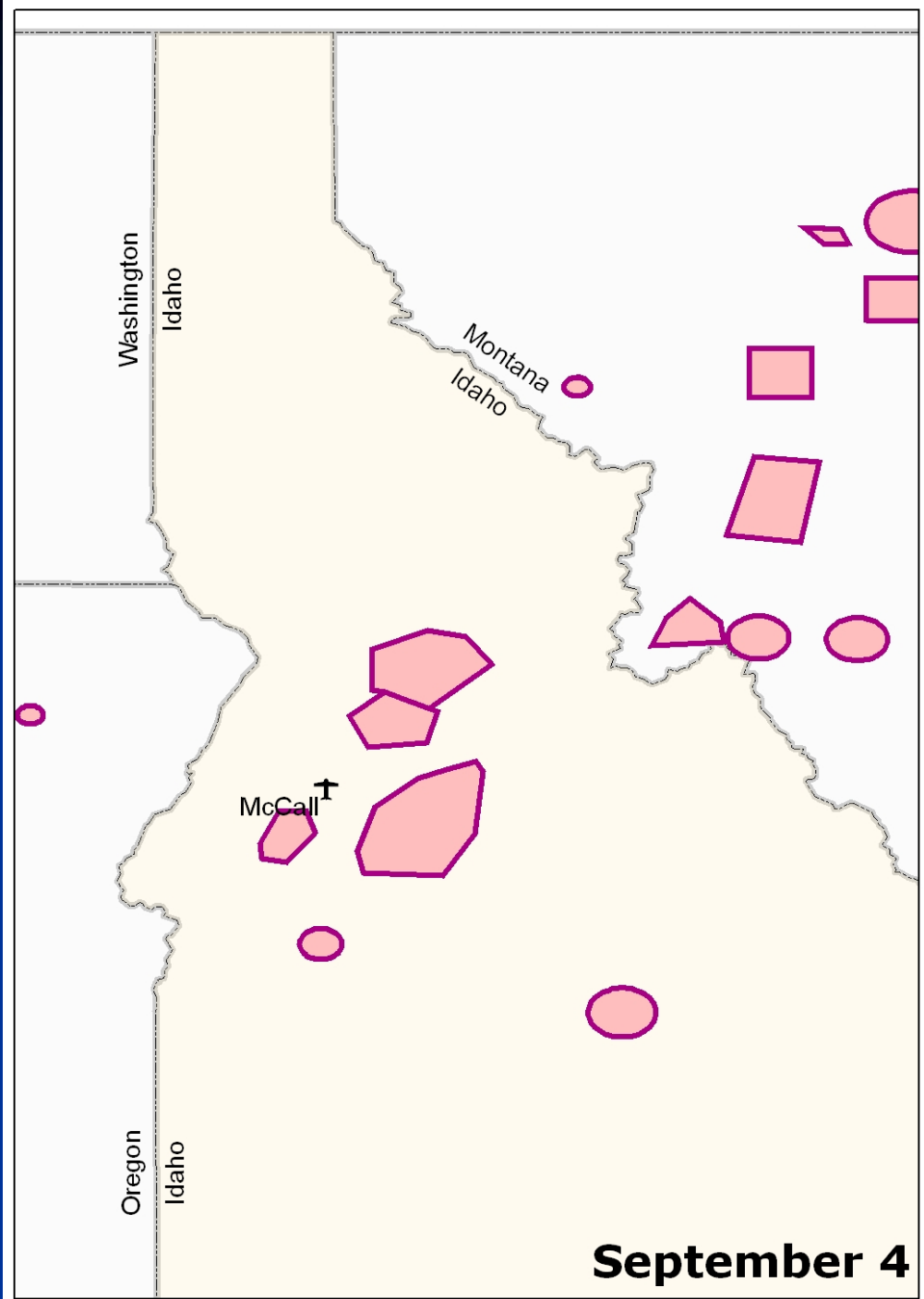


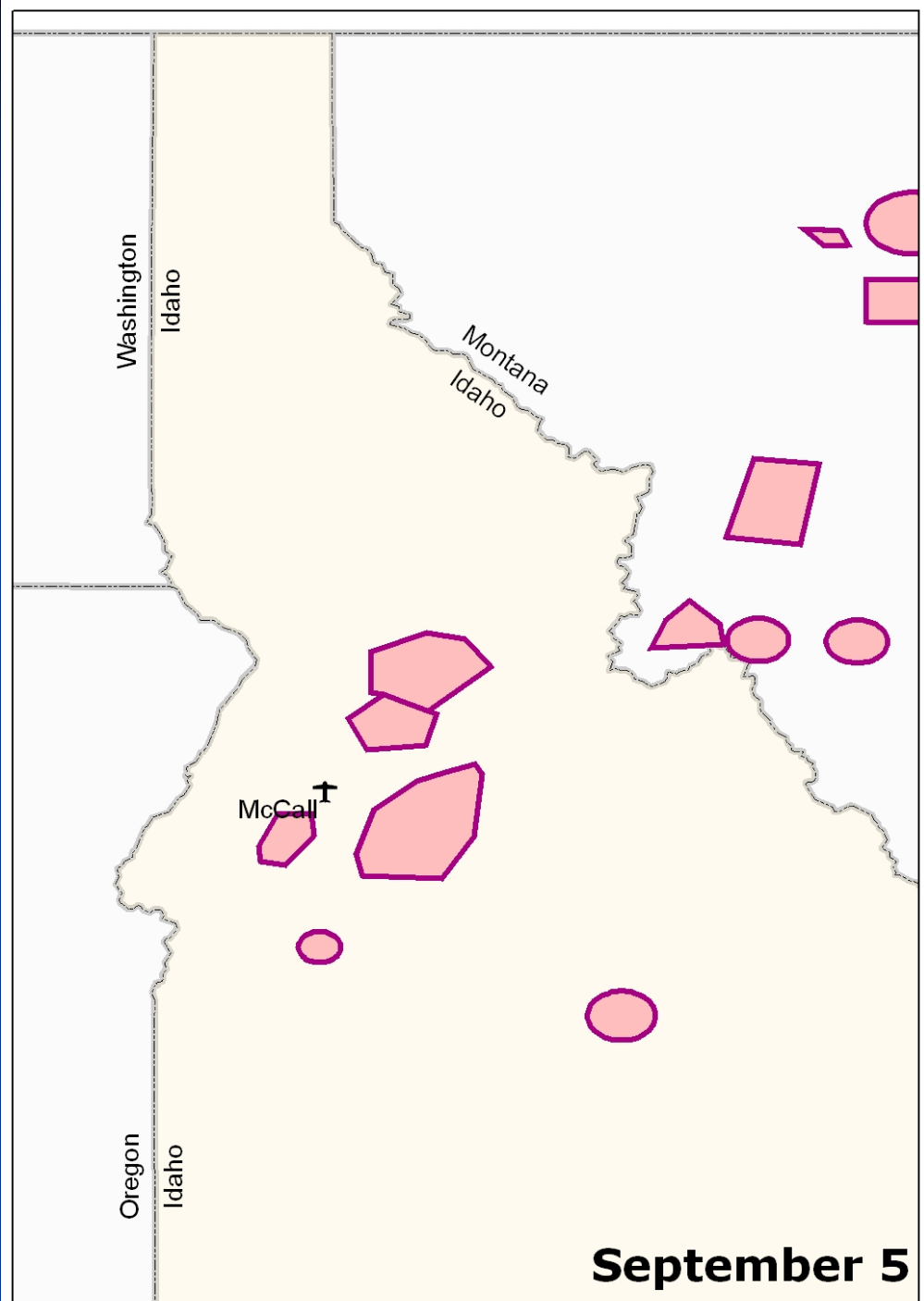


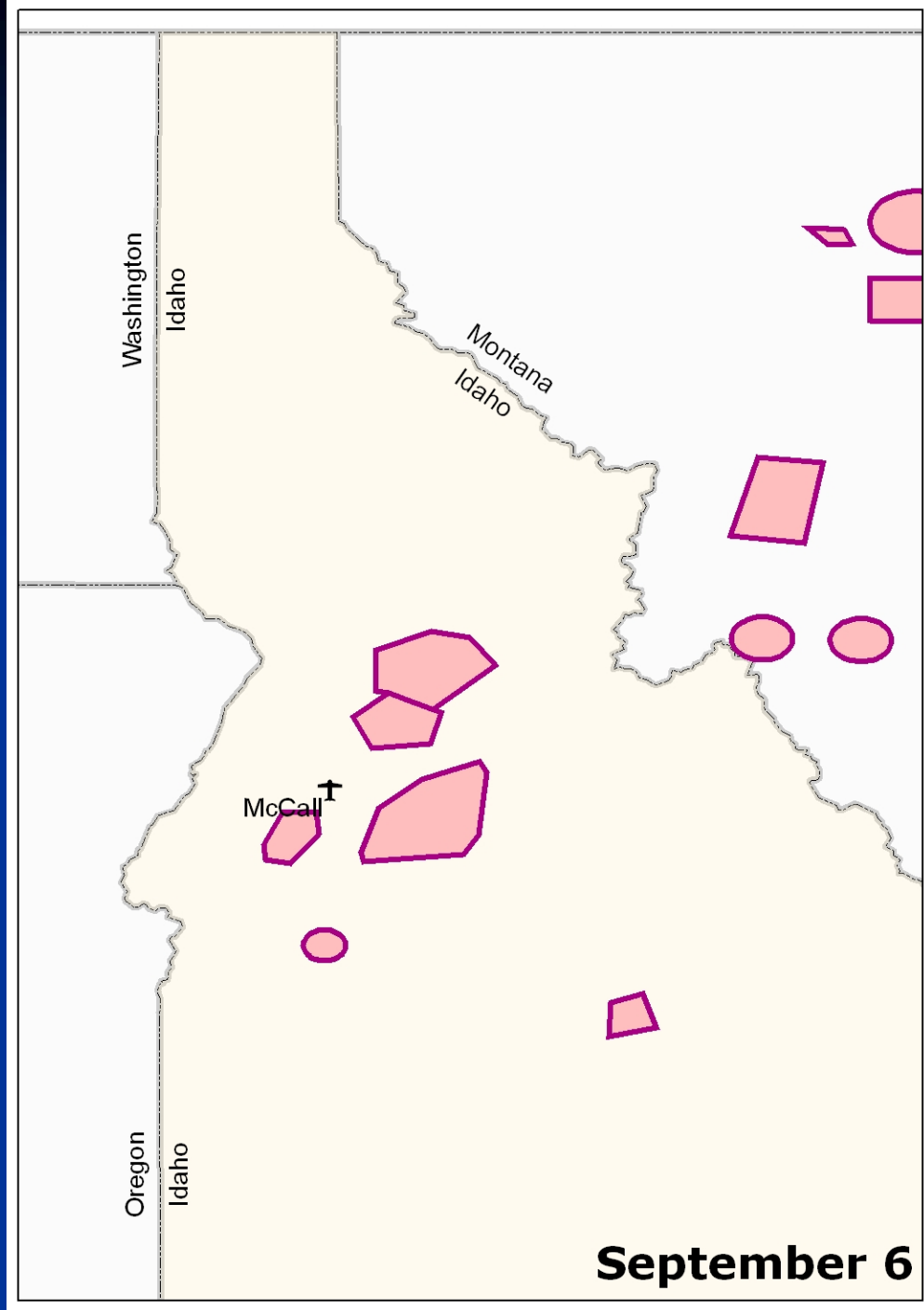


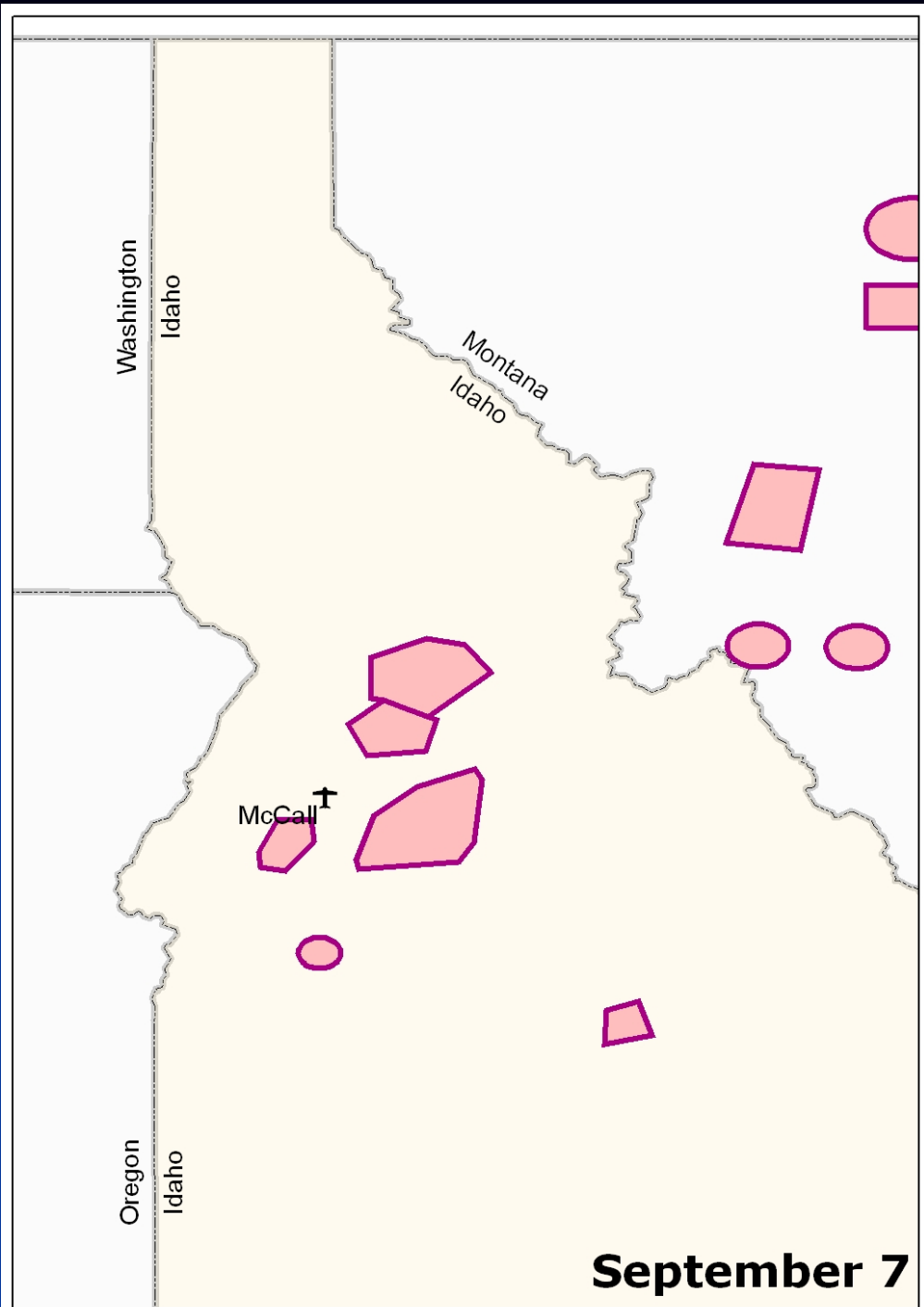


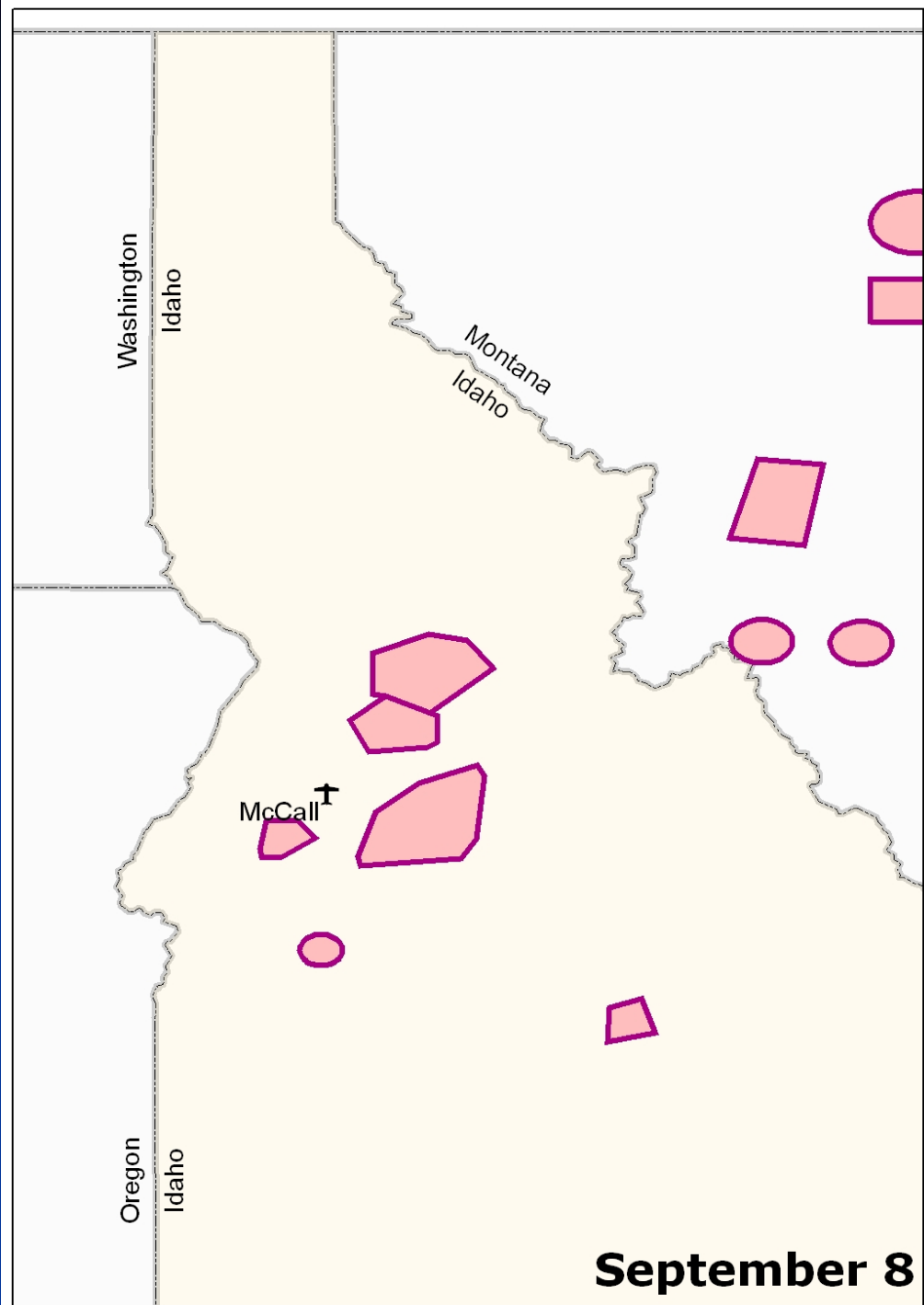


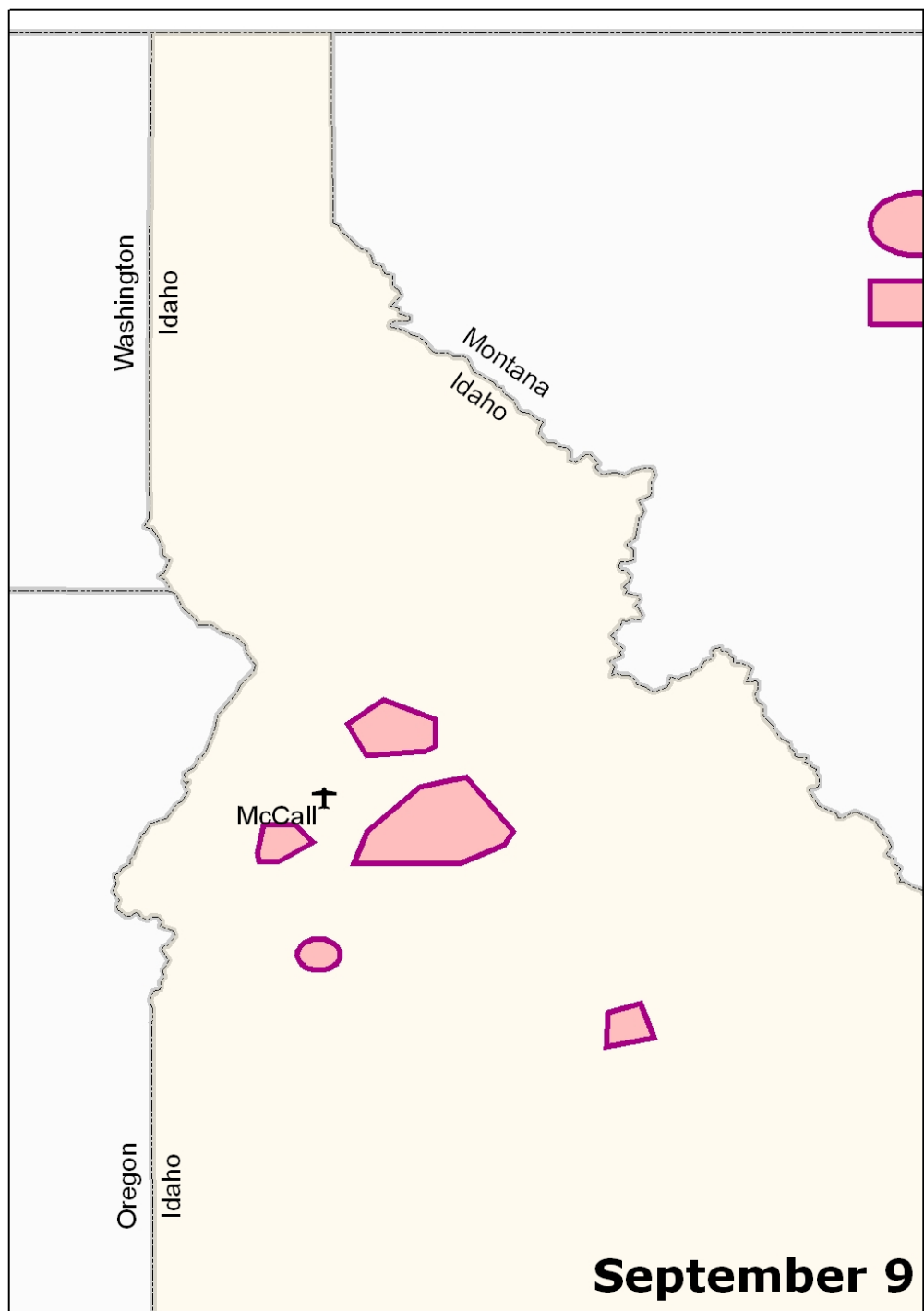


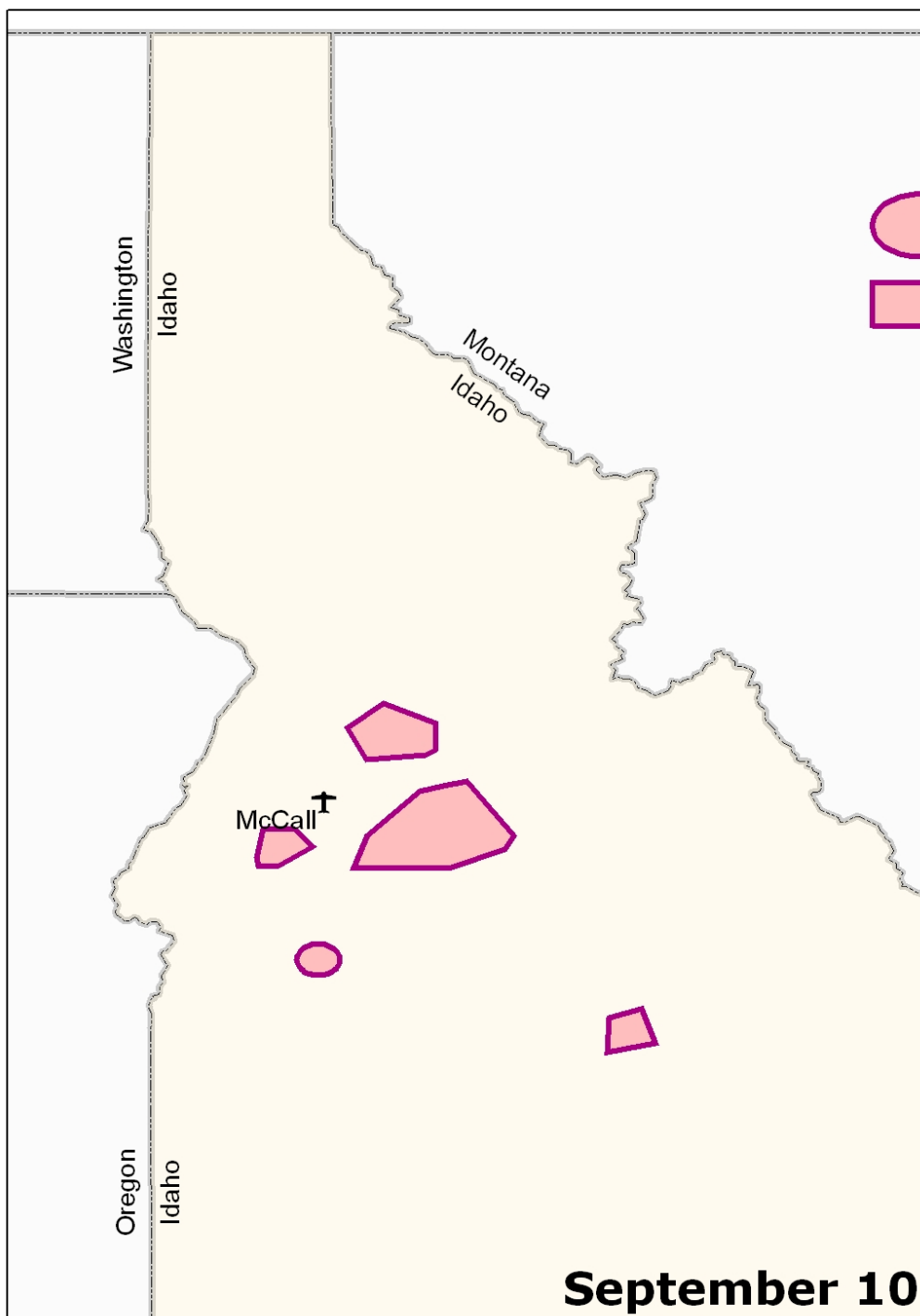


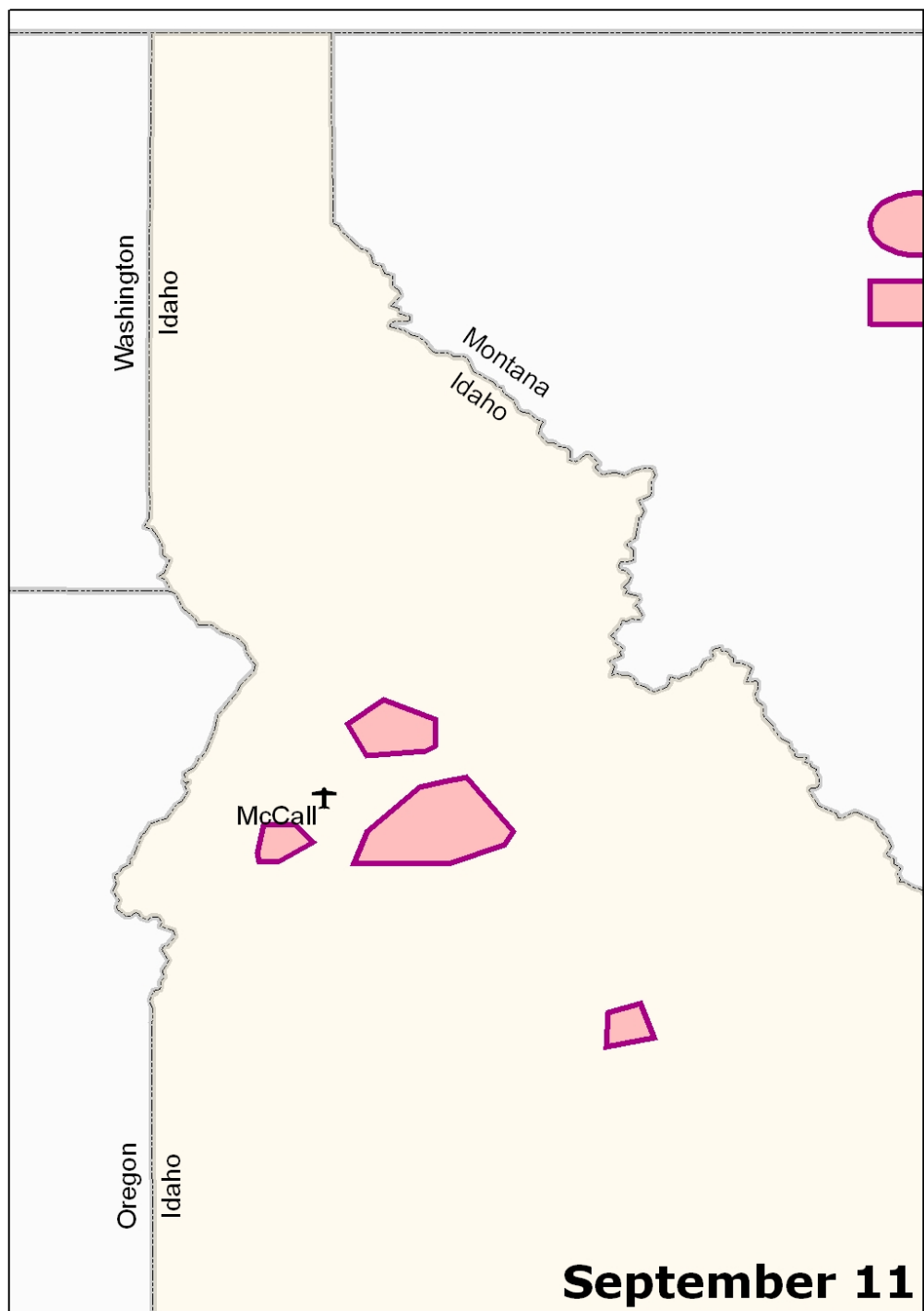


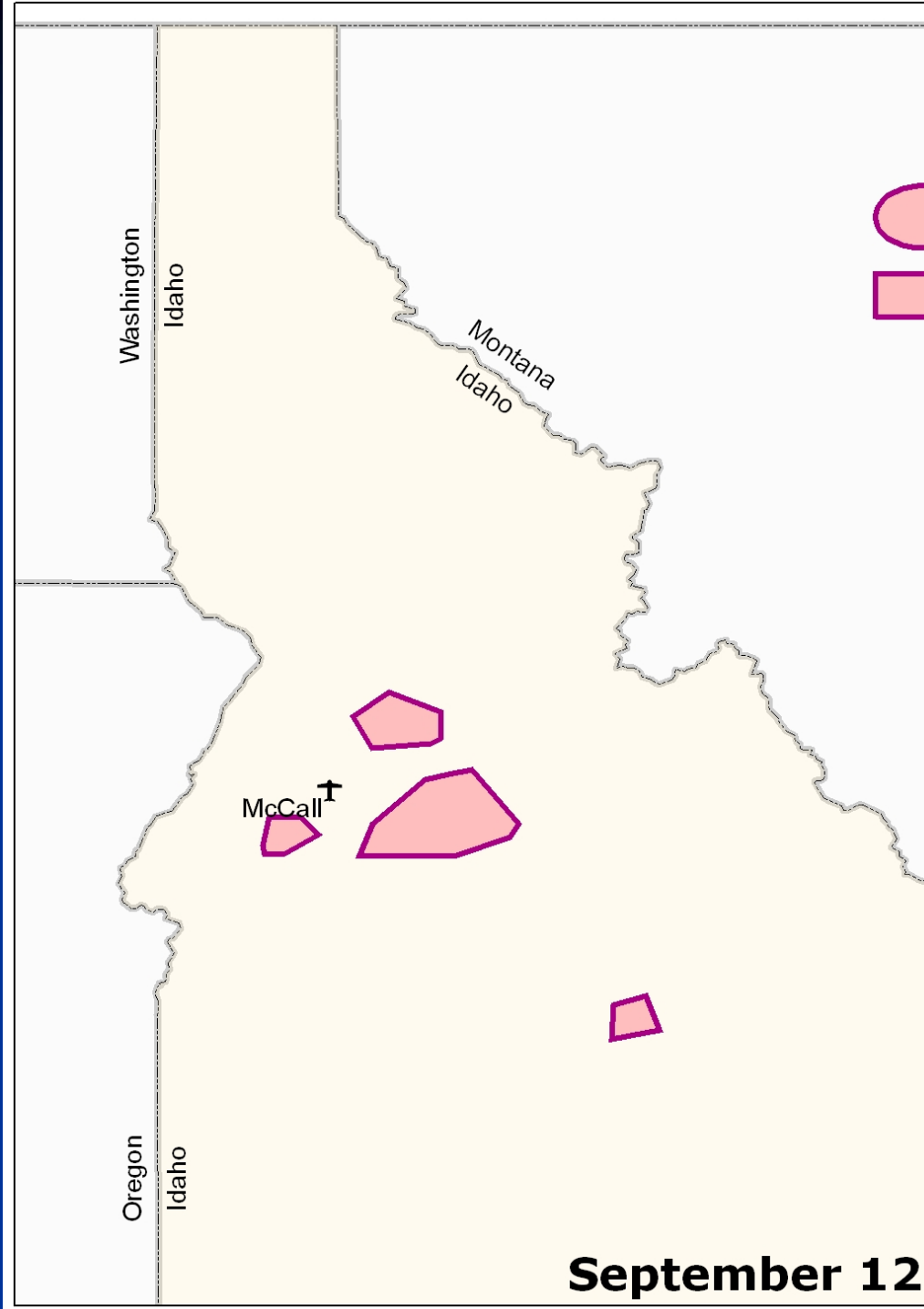


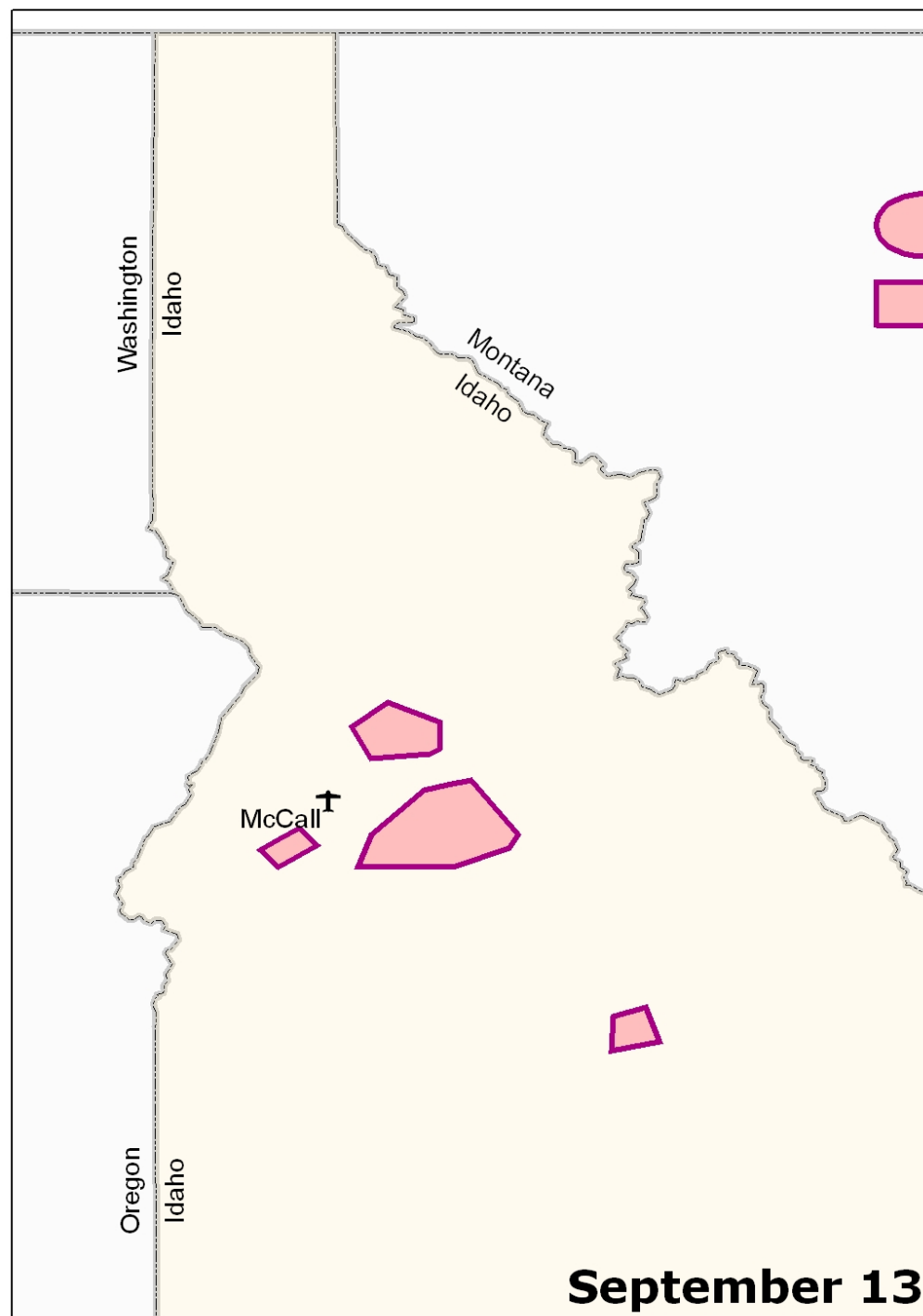


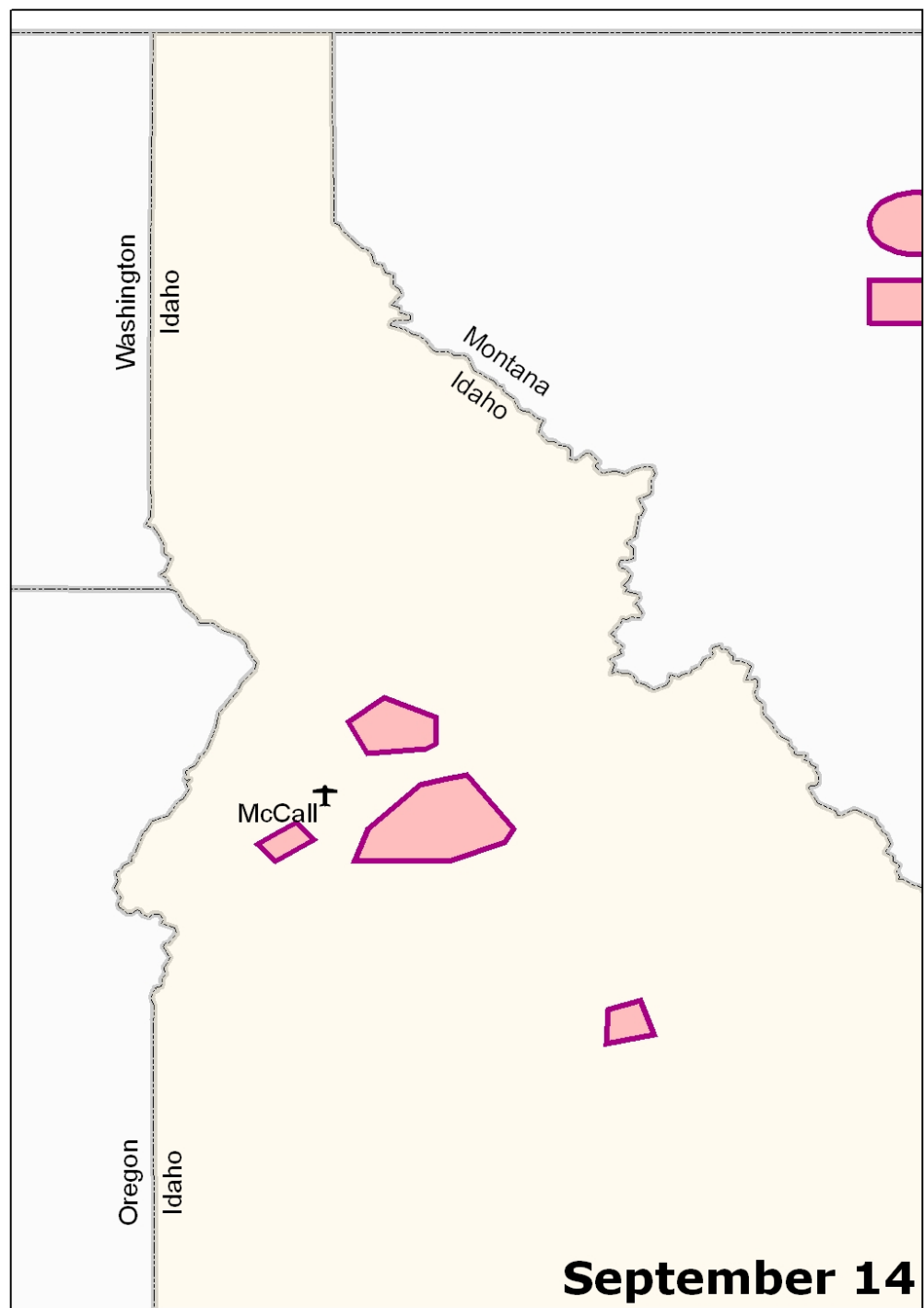


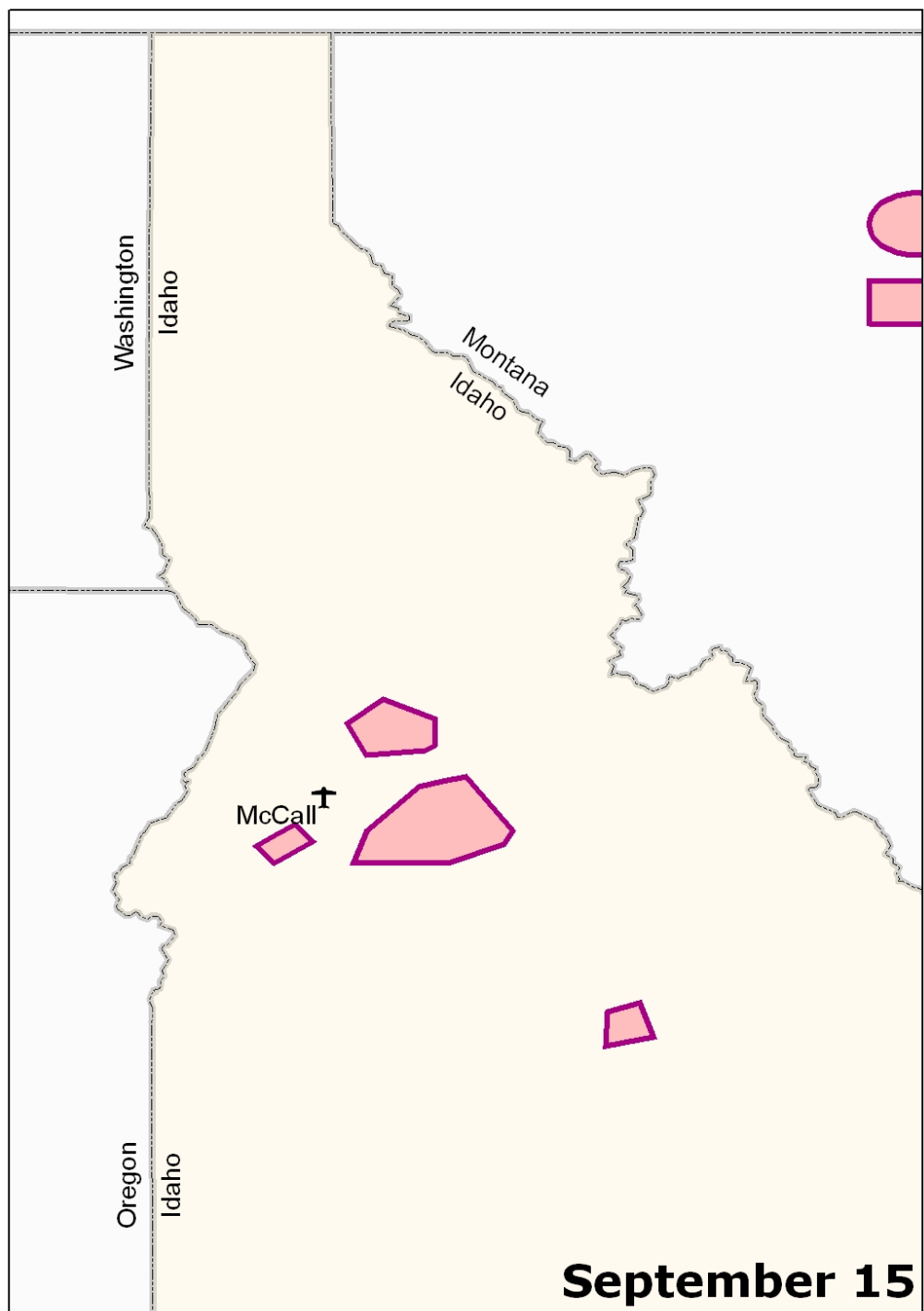


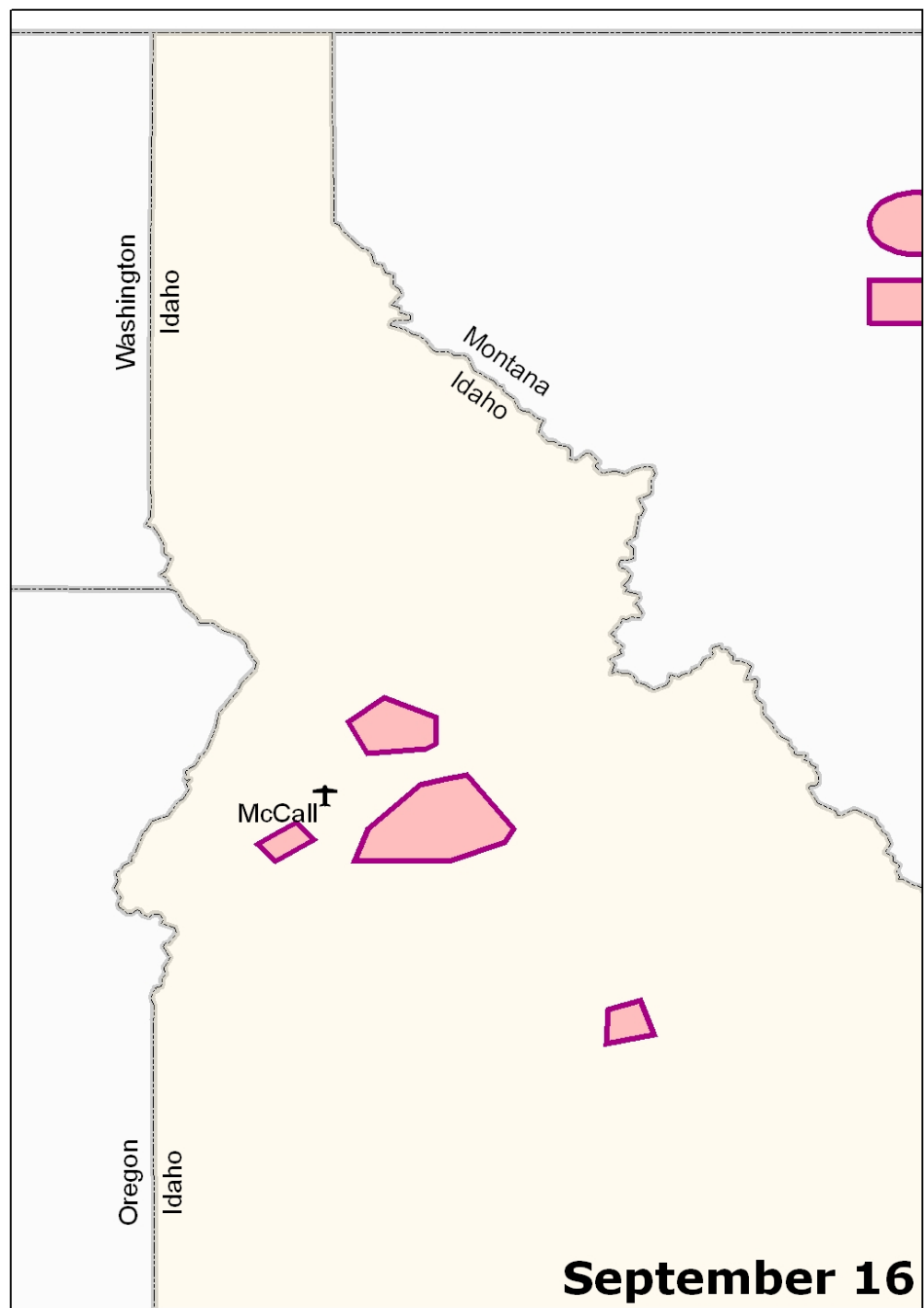


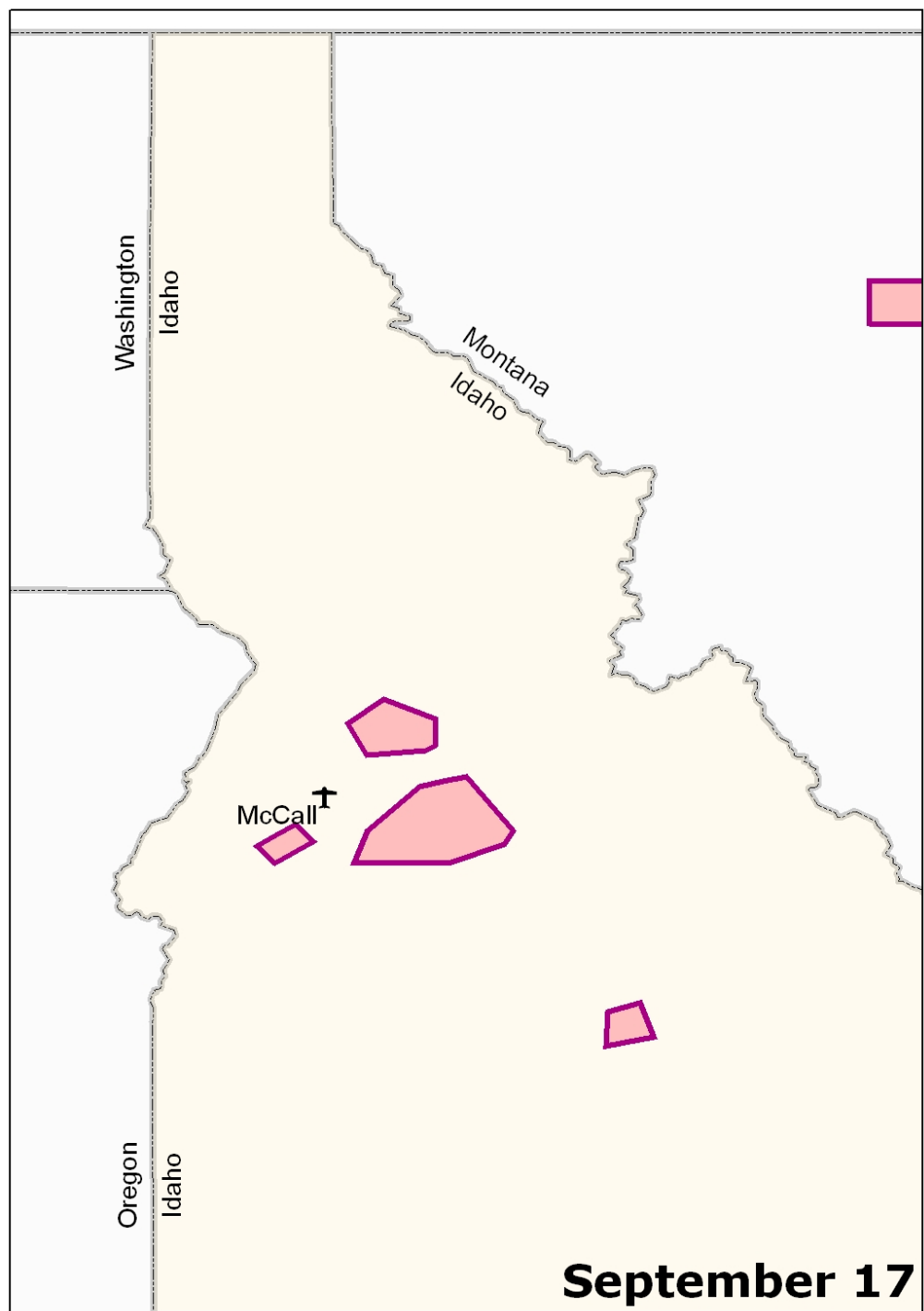


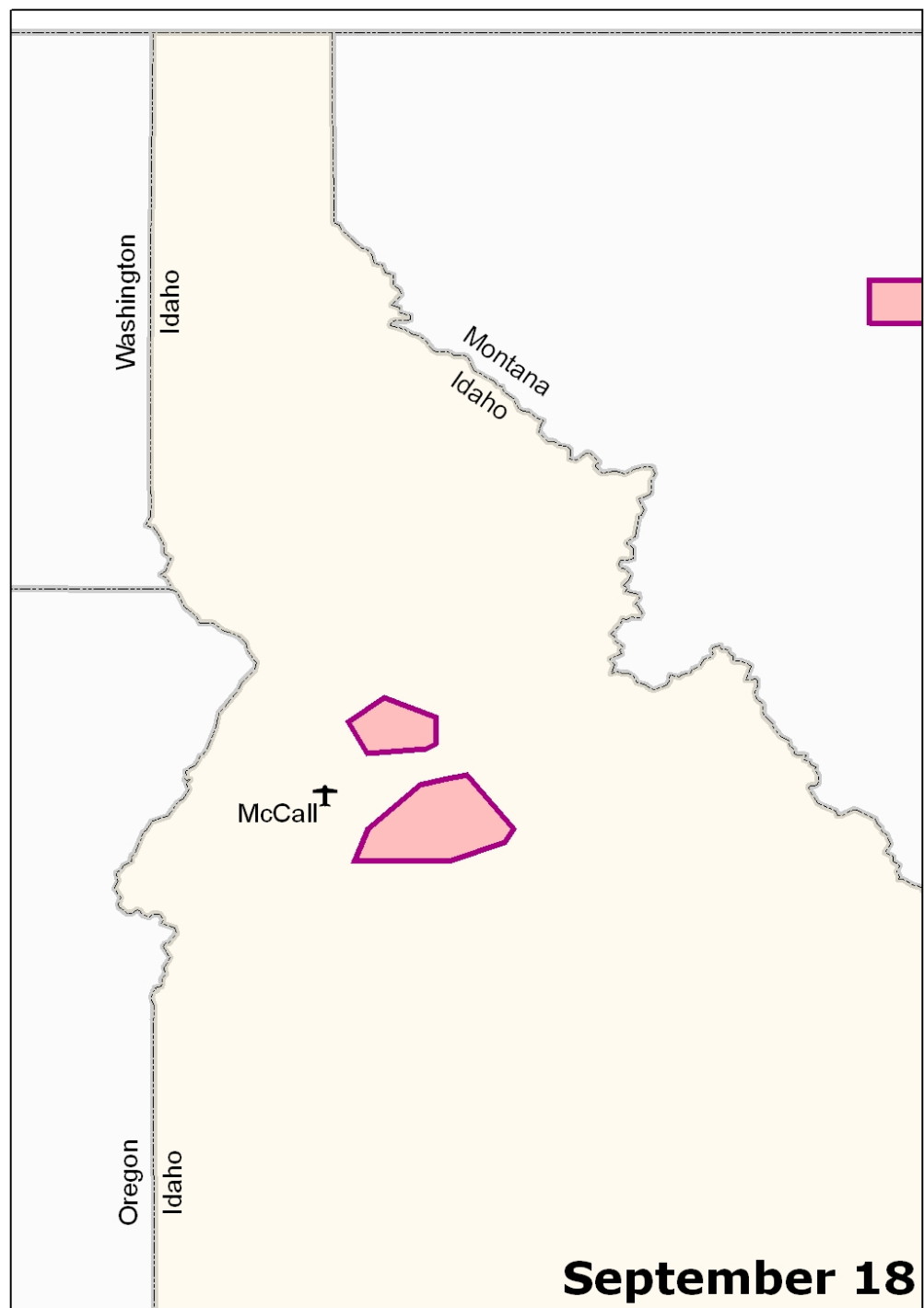








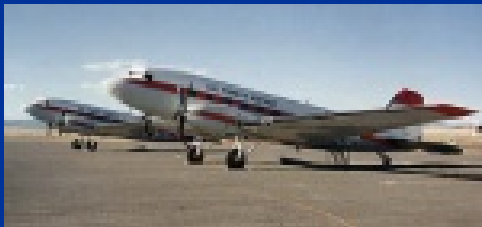




What is the Next Generation Aircraft for Firefighting?



Using Research and Development Centers to pave the way



Current Issues we are studying involving UAS

■ Issues:

- Airspace Coordination
- Command and Control
- Integration (not segregation)
- Interoperability
- Force Development



Unmanned Aircraft Studies began in October 1996 on the Lolo National Forest

- Israel Aircraft Industries tested their “Fire Scout” UAV
- Developed to provide real time information to fire managers
- IR/FLIR, Mapping, Weather info, radio relay, resource monitoring



June 2003



- USFS flew a MLB Bat on the slopes of the Mauna Loa volcano in Hawaii for vegetation surveys.



Mt St Helens 2004



Silver Fox at Mt St Helens



10/05/04

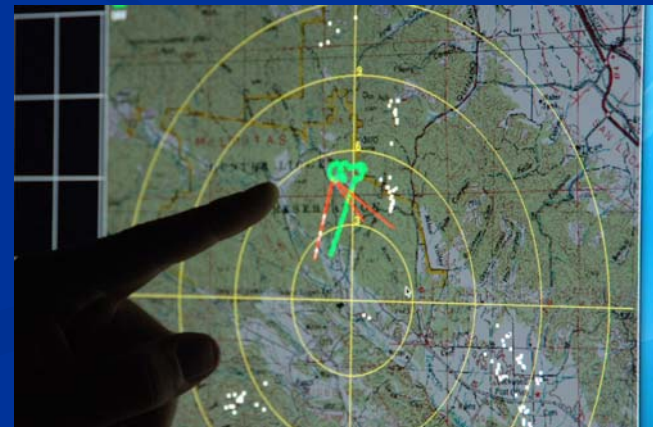
TJ Mullinax/katu.com

Ft Hunter Liggett Small UAS Demo, June 2006



Hosted by USFS Remote Sensing Application Center

- GOALS:
- Demo Autonomous Flt control
- Showcase UAS Systems to provide real time thermal images
- Showcase See and Avoid Display Systems (SAVDs)

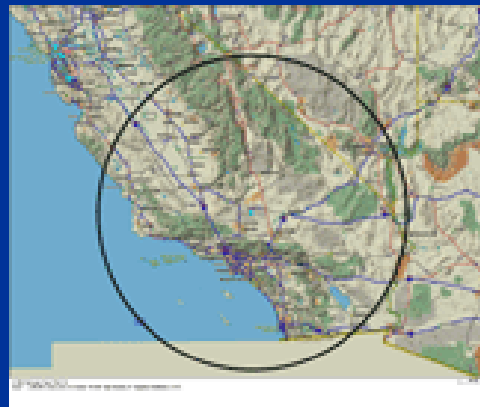
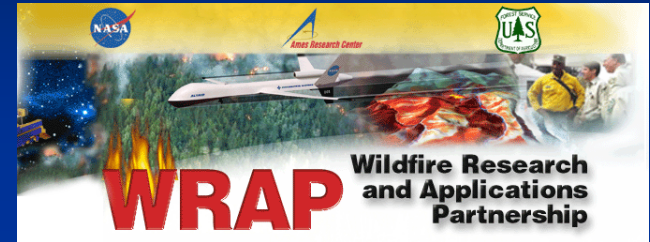


100 Interagency Participants Educating ourselves about UAS





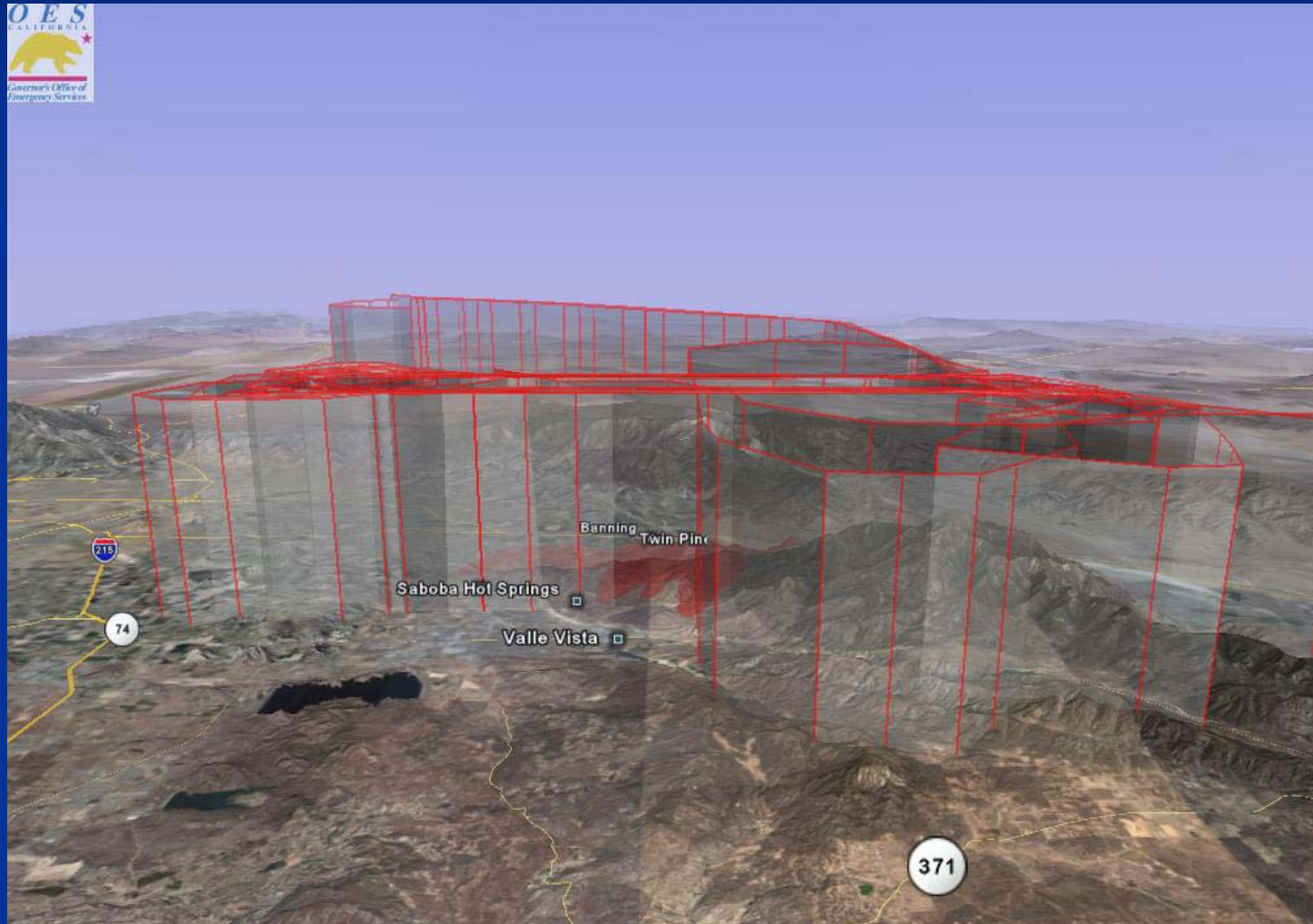
2006 NASA/USFS Western Research and Application Project (WRAP)



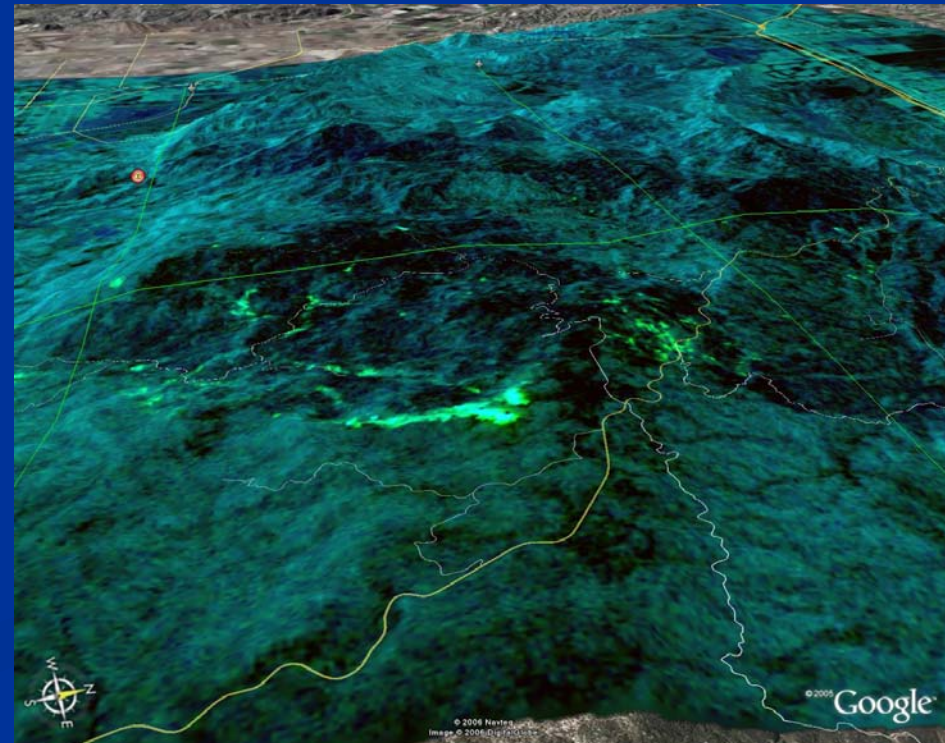
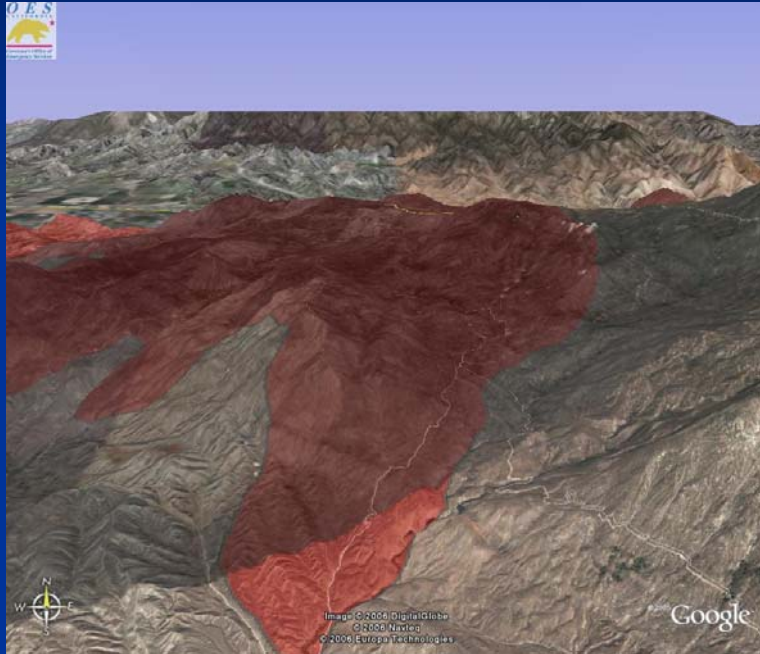
Supporting the Esperanza Fire



16 hours of flight above the fire at FL430



More than 20 Maps developed in real time

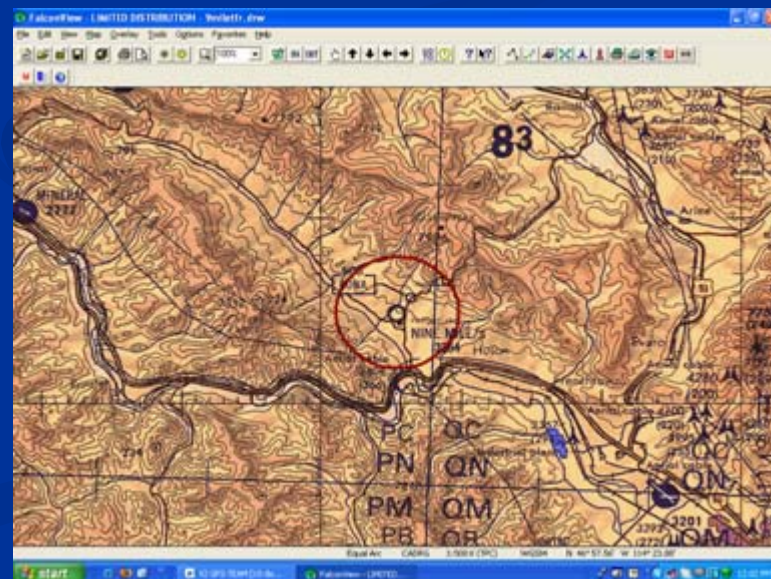
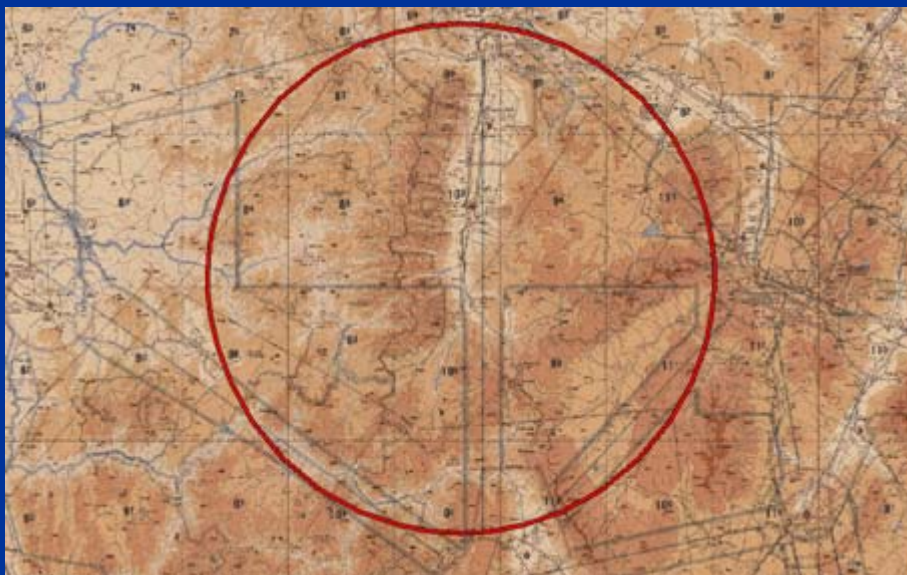


2006 Missoula Technical Equipment Development Center (MTDC) UAS Study



MTDC UAS Study

- Studying Small aircraft that could fit inside a backpack
- COA is at the USFS Nine Mile Airstrip in remote Montana
- 10 Hours Flown



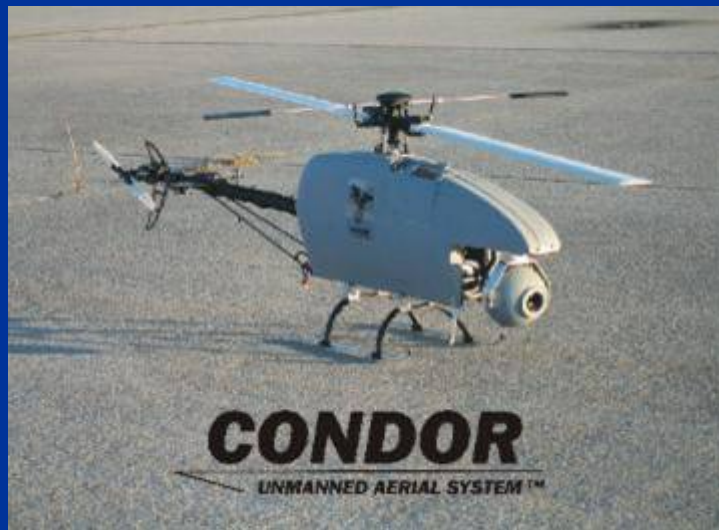
MTDC Continued

- Testing Optics (Color, B&W, Thermal) under multiple light conditions
- Fixed camera vs gimbaled
- High DA, Mountain turbulence, fire turbulence – can a small UAS fly?
- Weather Sensors, microclimate sensing



MTDC Continued

- Locally launched, locally retrieved, very remote difficult terrain/vegetation
- Build an Infrastructure within the fire community to support operations



Extending Wifi and Broadband Internet Connection

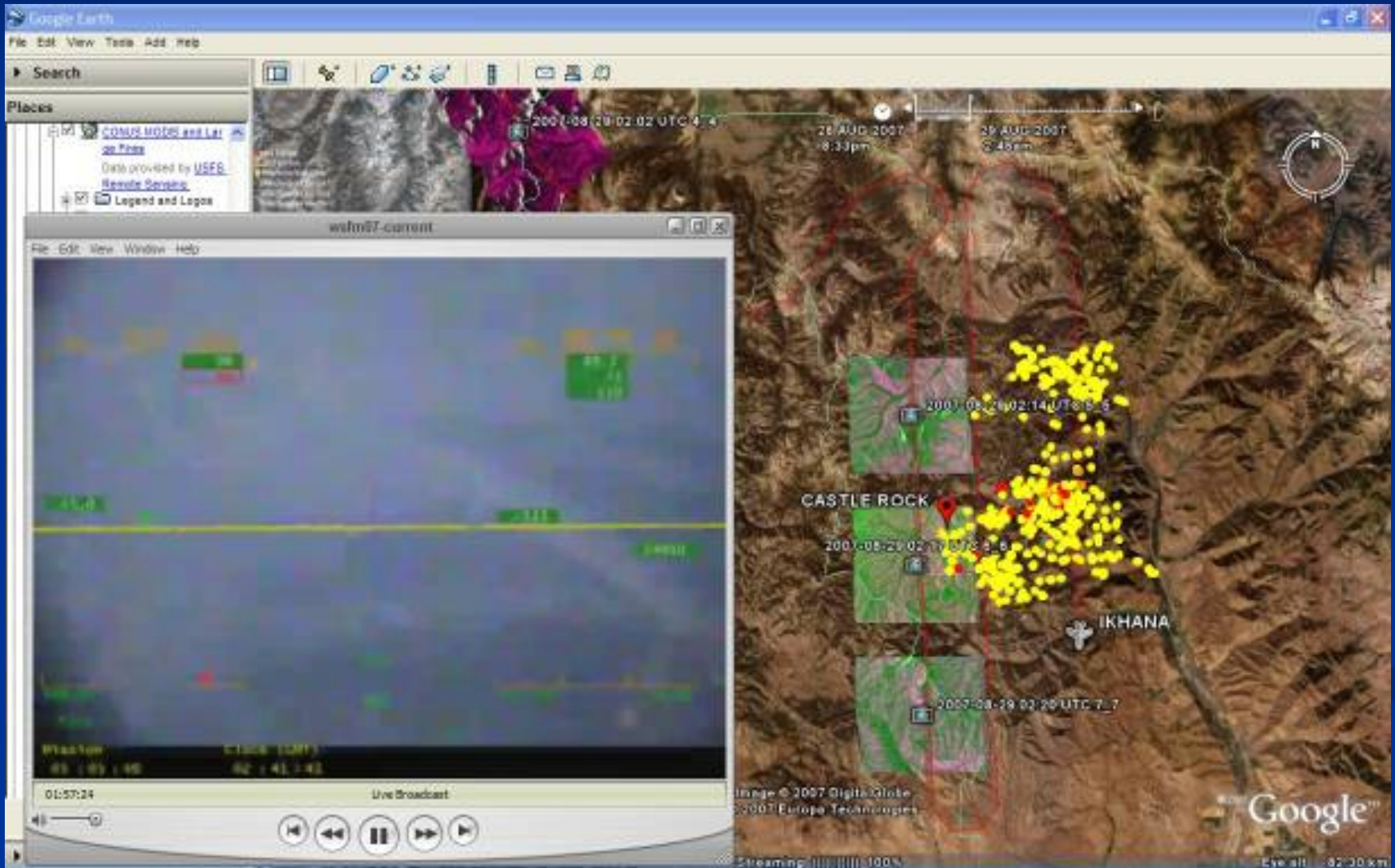


NASA/USFS Ikhana UAS 2007



CDE Display

Flight Track/Images/MODIS

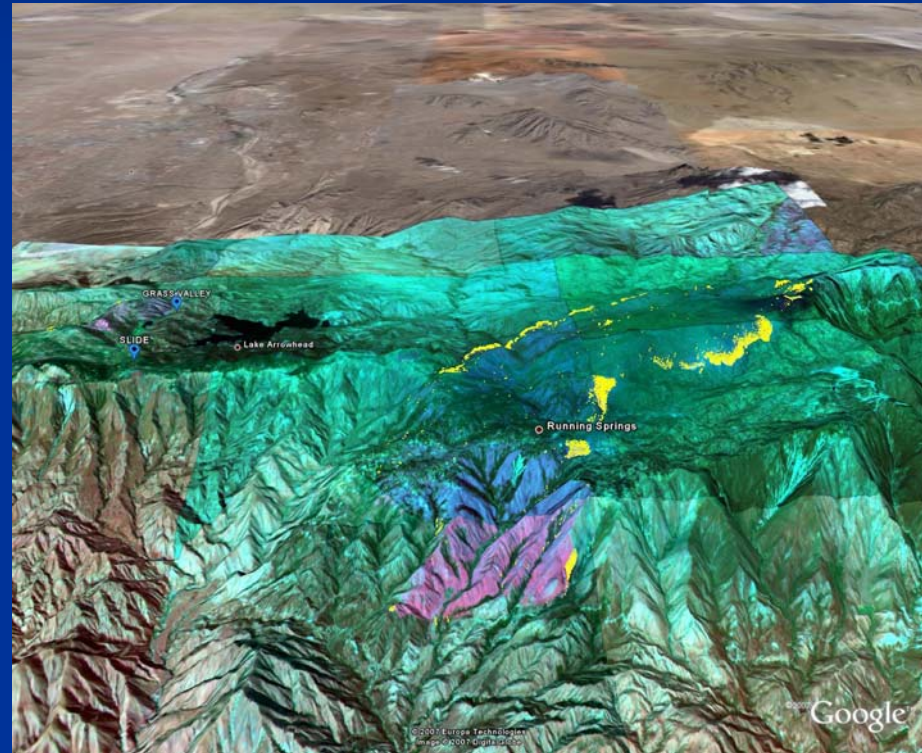


Watching History in the Making

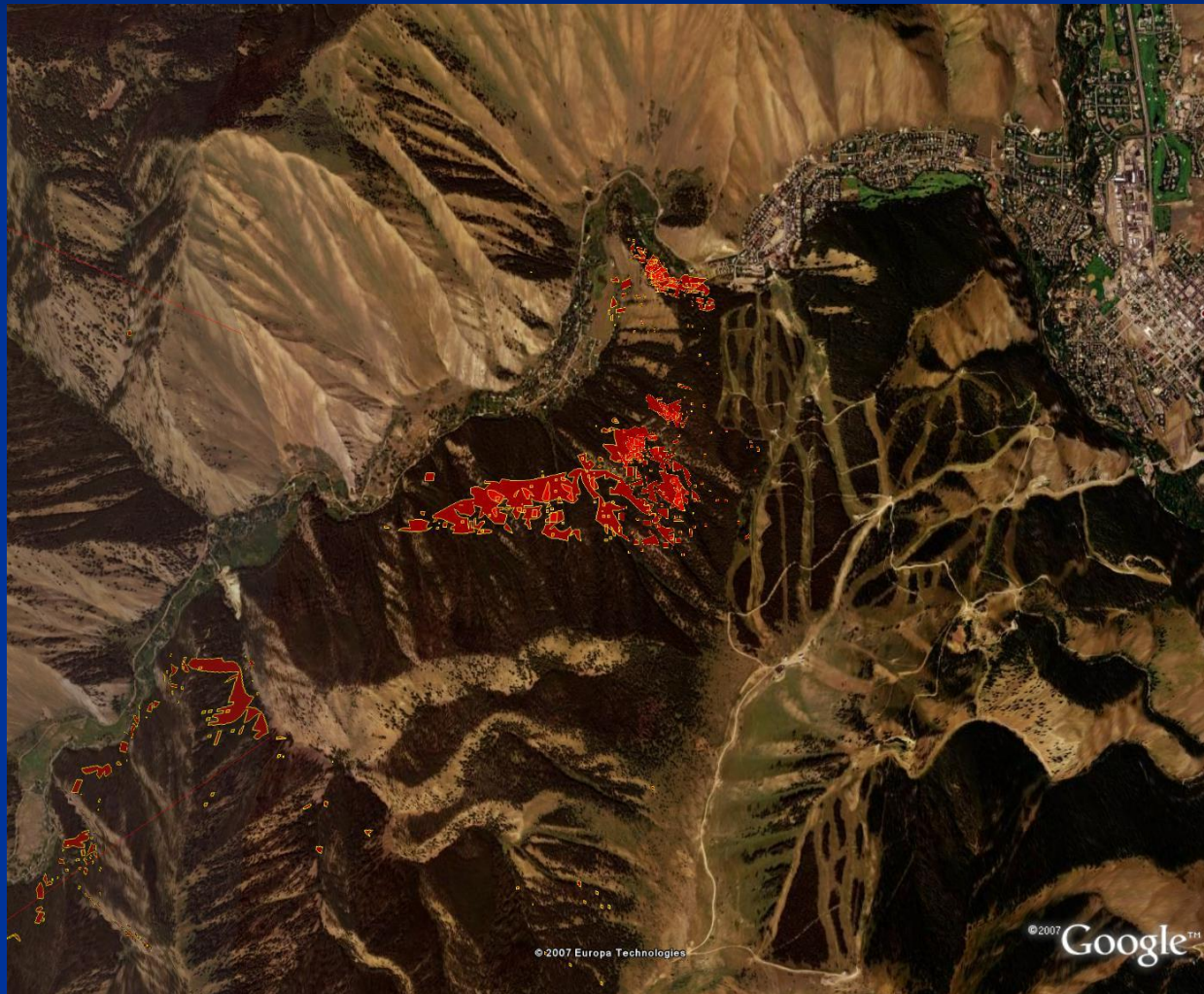


Providing Real Time Images to Incident Management Teams

- Pod Line Scanner
- Georectifies
- Provided Shape Files
- Didn't want to make the firefighter a photo interpreter
- 10 minute delivery



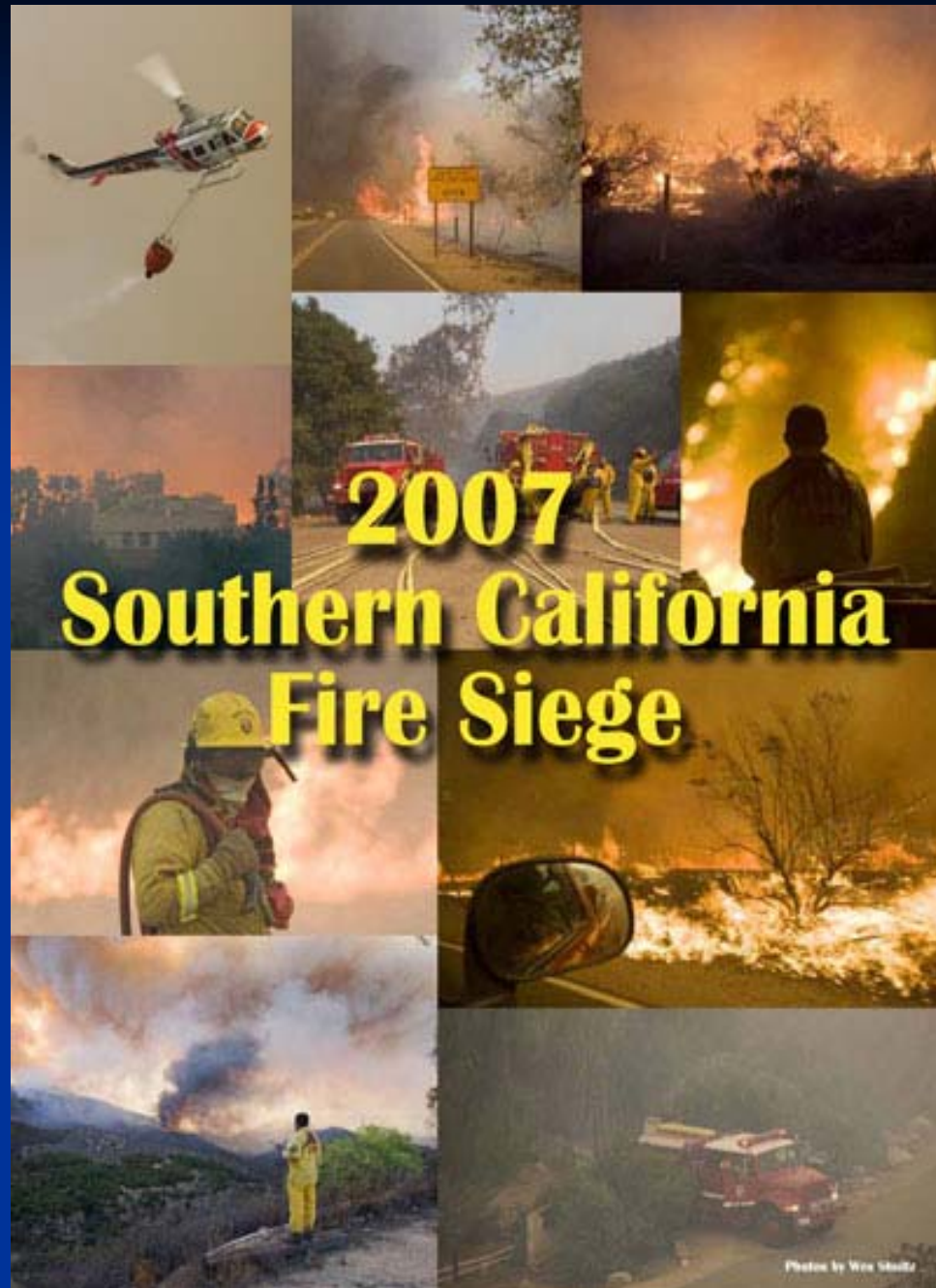
Incredible Detail



Technological Advances through the UAS WRAP Program

- UAS ability to stay over a location for an entire duty cycle remains an asset
- Sensors
- Data Links
- Displays





2007

Southern California Fire Siege

Photos by Wex Shultz

The Challenges of California Airspace



Some of the most complex airspace in the nation



Complications were almost beyond belief



Two NASA Pictures Three Hours Apart



11:35 am (PDT)



2:50 pm (PDT)

One MILLION people evacuated



Miramar Aircraft Evacuated

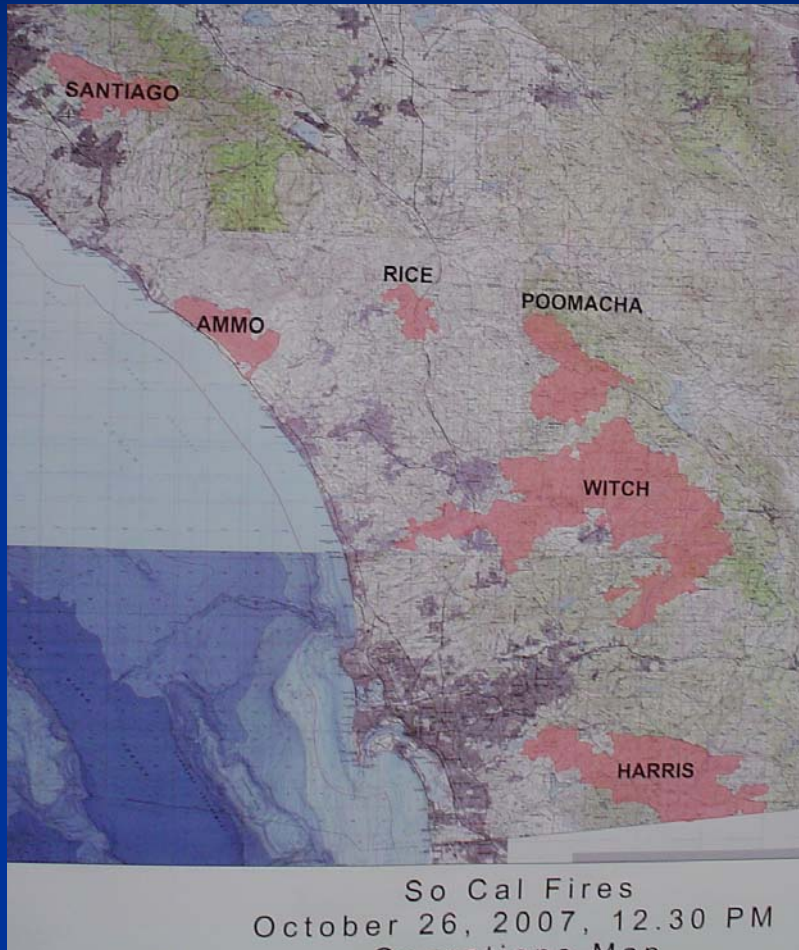
- USMC relocated 287 aircraft from Miramar Marine Corps Air Station to AZ



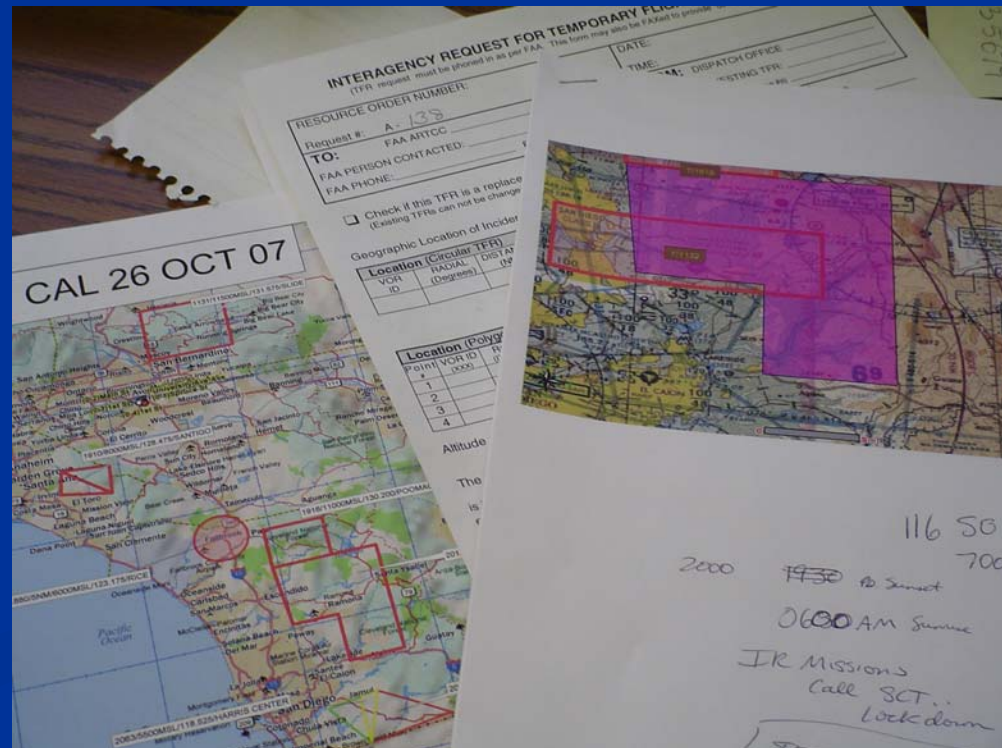
FEMA Aviation Coordination Group deployed



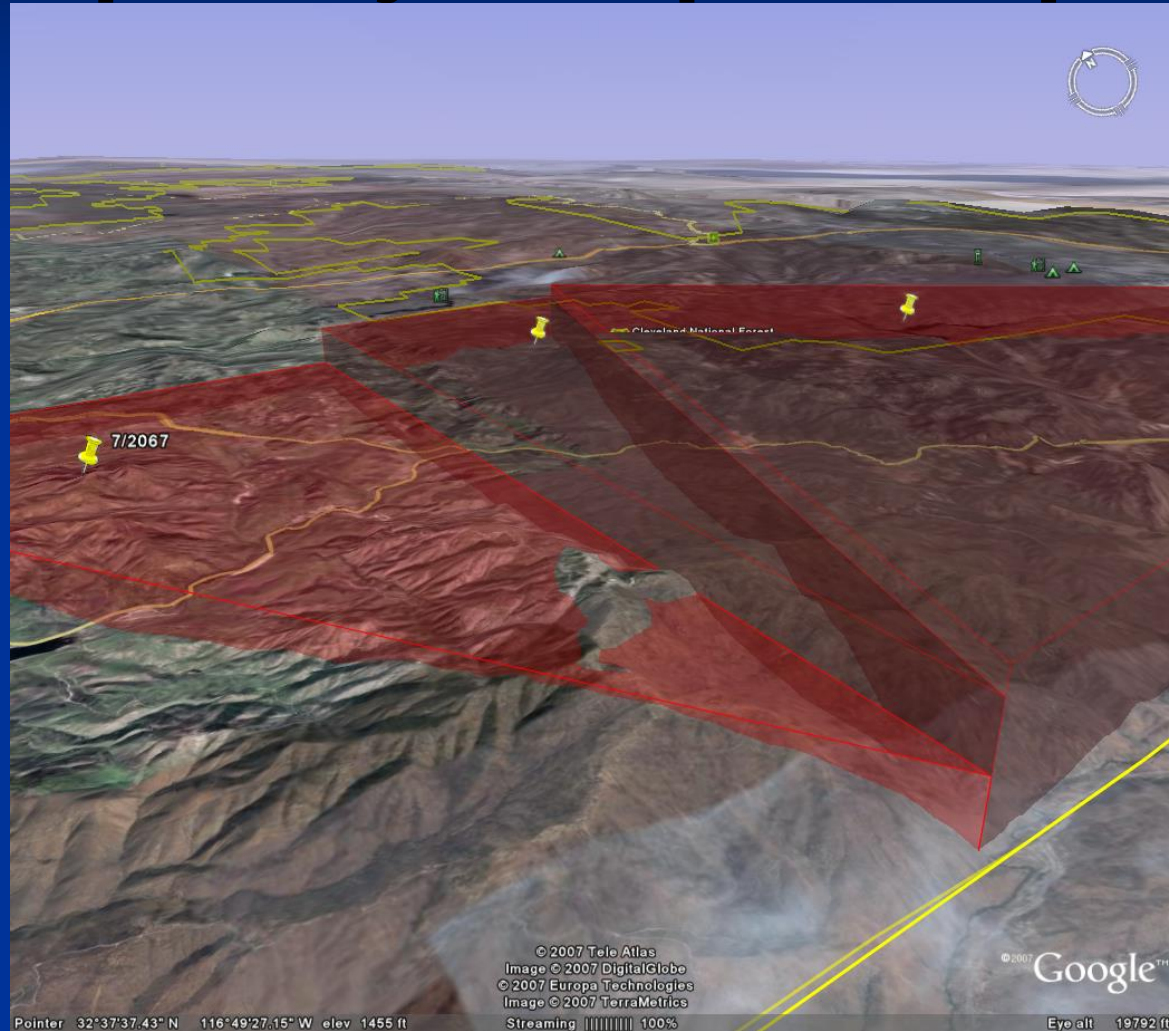
Meeting the Fires and the FAA's needs



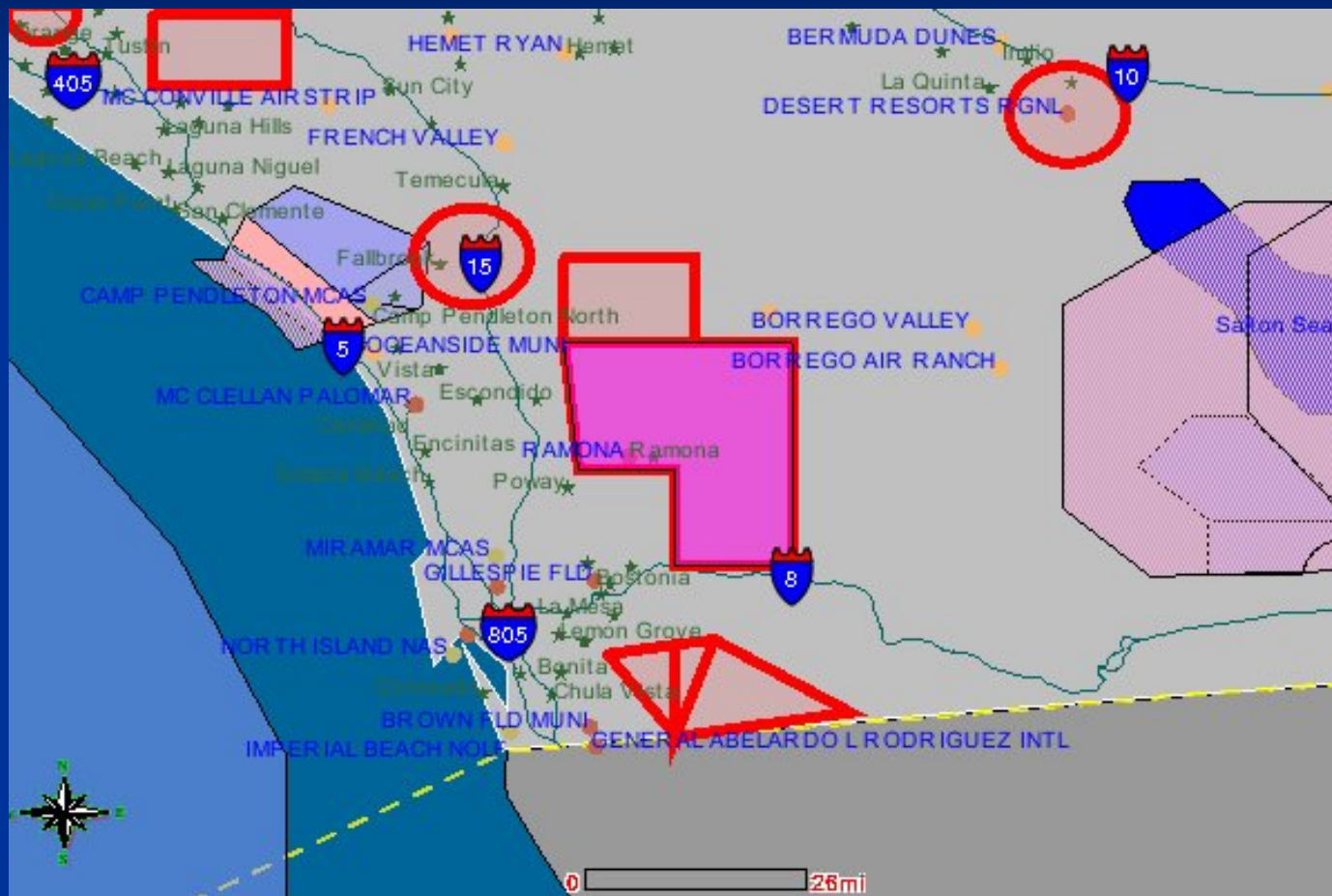
So Cal Fires
October 26, 2007, 12.30 PM
Operations Map



Successful TFR Negotiations kept major airports open



The TFR Big Picture



Southern California Fire Effects on Public Use Airports

Wednesday October 25, 2007 9:45 AM Local Time

Southern Cal Logistics: Airport is open and operating normally. Extensive aerial firefighting operations occurring at the airport including DC-10 Tanker operations.

Fox Field: Airport is open and operating normally. Extensive aerial firefighting operations occurring at the airport.

Agua Dulce: This is a privately owned public use non-NPIAS airport. Airport is open and operating normally.

Camarillo: Airport is open and operating normally.

Fallbrook: Airport is closed to all but emergency operations. Heavy lift firefighting helicopters are operating from the runway.

Oceanside: Airport is open and operating normally.

McClellan Palomar: Airport is open and operating normally.

Lindbergh Field: Airport is open and operating normally.

Brown Field: The airport is open and operating normally. Extensive firefighting operations occurring at the airport.

Note: All FAR Part 139 Airports are open and operating normally. LAX, BUR, PSP, OXR, LGB, SNA, SAN, CRQ, ONT, & VCV

San Bernardino International: Airport is open and operating normally. **FAA is operating a temporary tower at this airport.** Extensive aerial firefighting operations occurring at the airport.

Big Bear: Airport is open. Extensive aerial firefighting operations occurring at the airport.

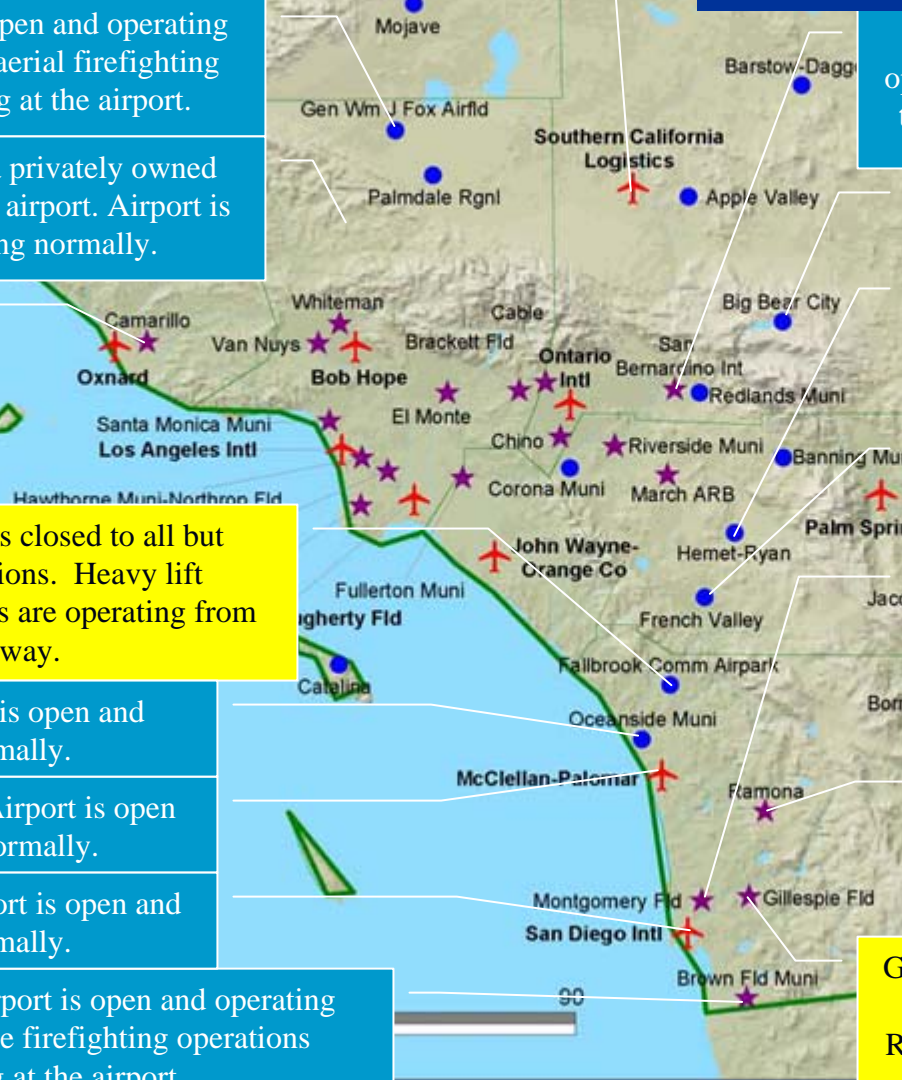
Hemet Ryan: Airport is open and operating normally. **FAA is operating a temporary tower at this airport.** Extensive aerial firefighting operations occurring at the airport.

French Valley: Airport is open and operating normally. A small number of local pilots have evacuated to the airport.

Montgomery: North east 1,400 feet of Runway 5/23 is closed to accommodate aerial firefighting and ground support operations. Rwy 10L/28R (4,577 X 150) and Runway 10R/28L (3,401 X 60) are open for public use.

Ramona: The airport is open and operating normally. Extensive aerial firefighting operations occurring at the airport. The non-federal tower is operating normally.

Gillespie: Runway 9R/27L is closed to accommodate aerial firefighting and ground support operations. Rwy 9L/27R (5,342 X 100) and Rwy 17/35 (4,145 X 100) are open for public use.



Gillespie Field

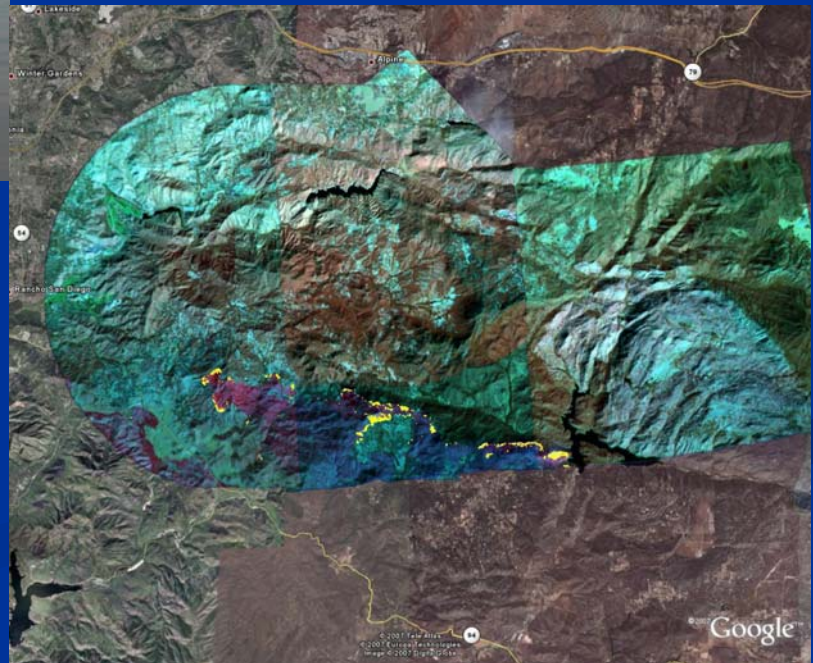
- Areas of Gillespie Field are being used as a staging area for ground firefighting operations and as an evacuation site for large domestic animals (horses, etc.)
- Rwy 9R/27L closed for fire support activities.



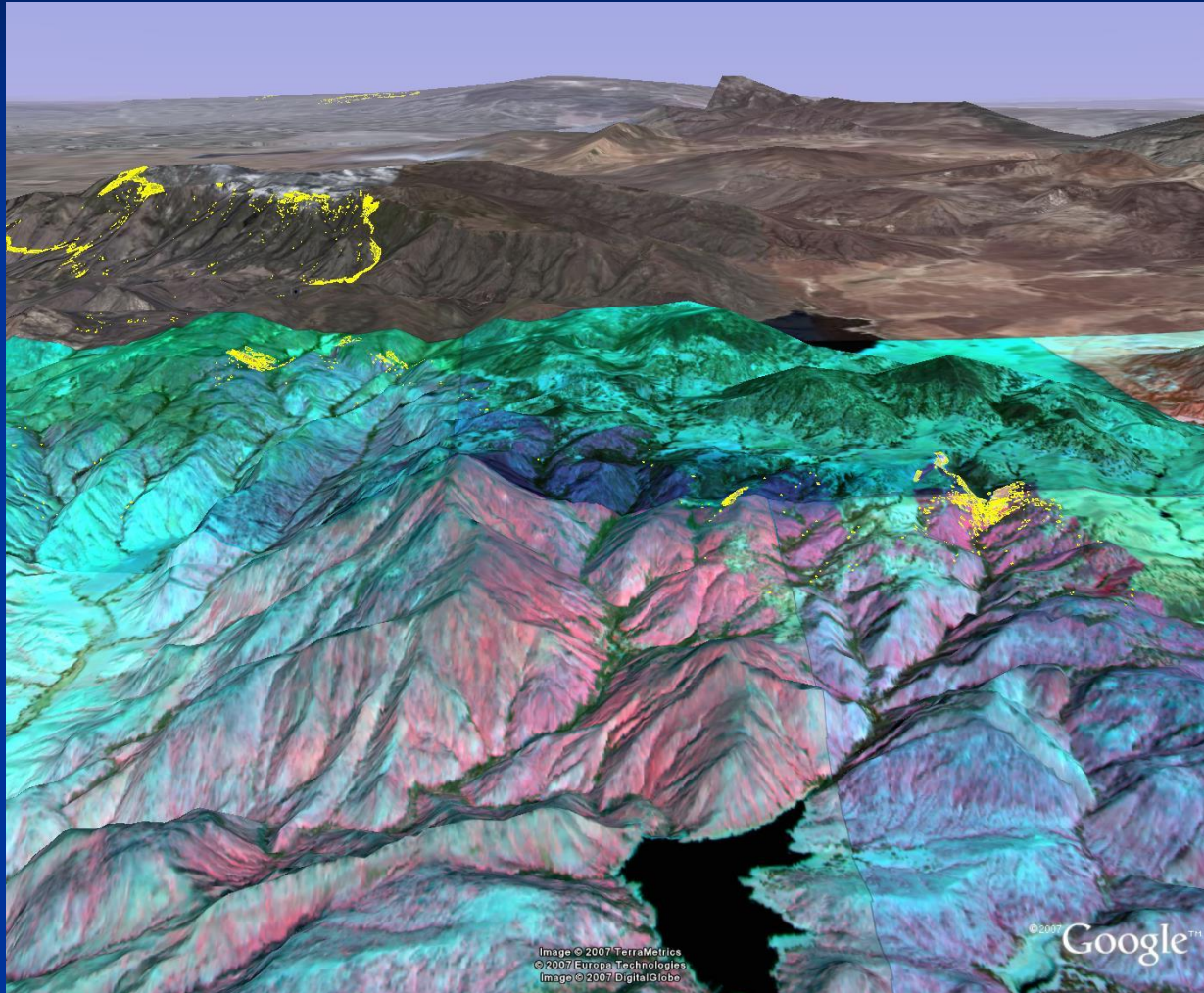
Ikhana Program Re-activated



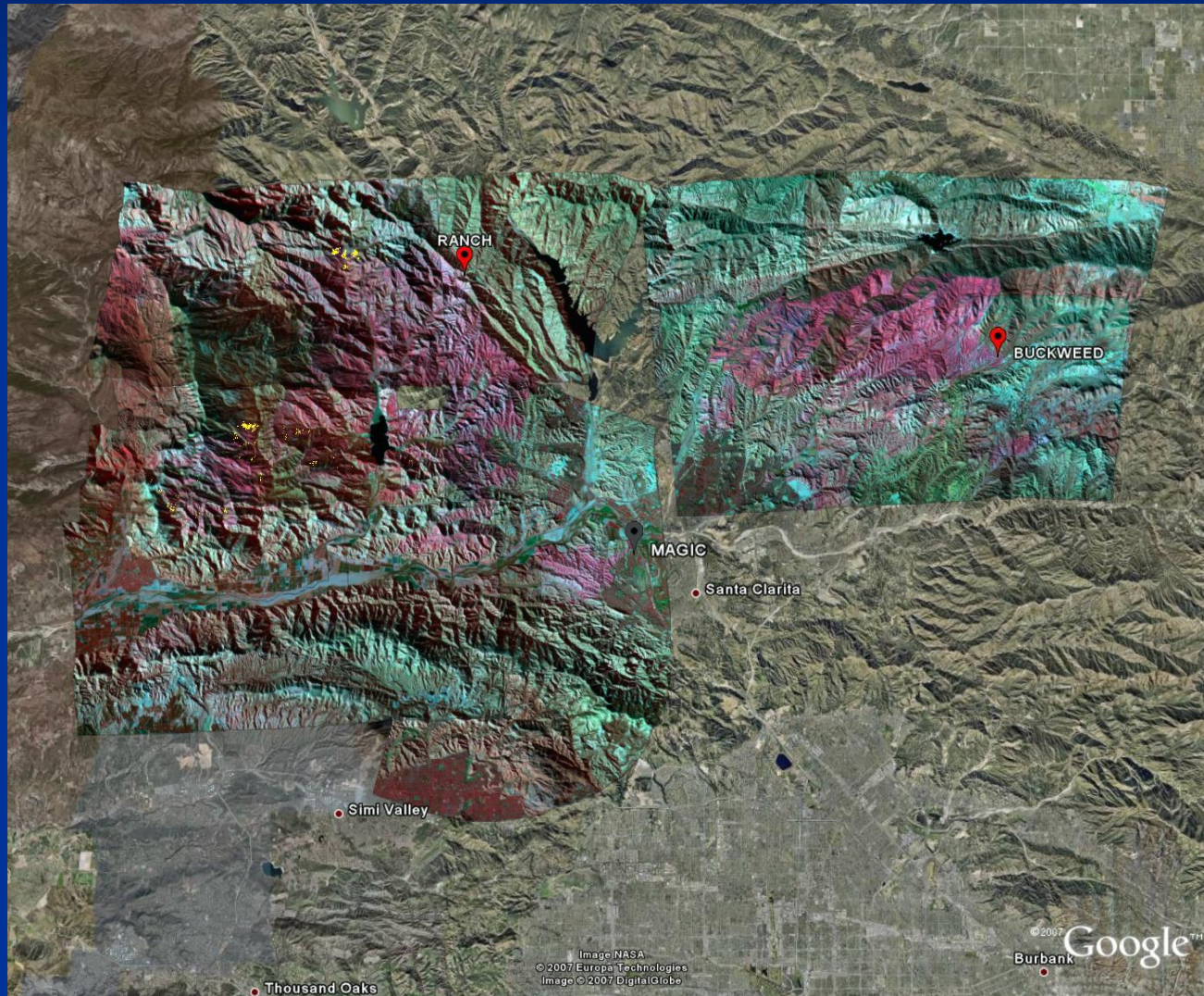
Ikhana Imagery direct to IMTs



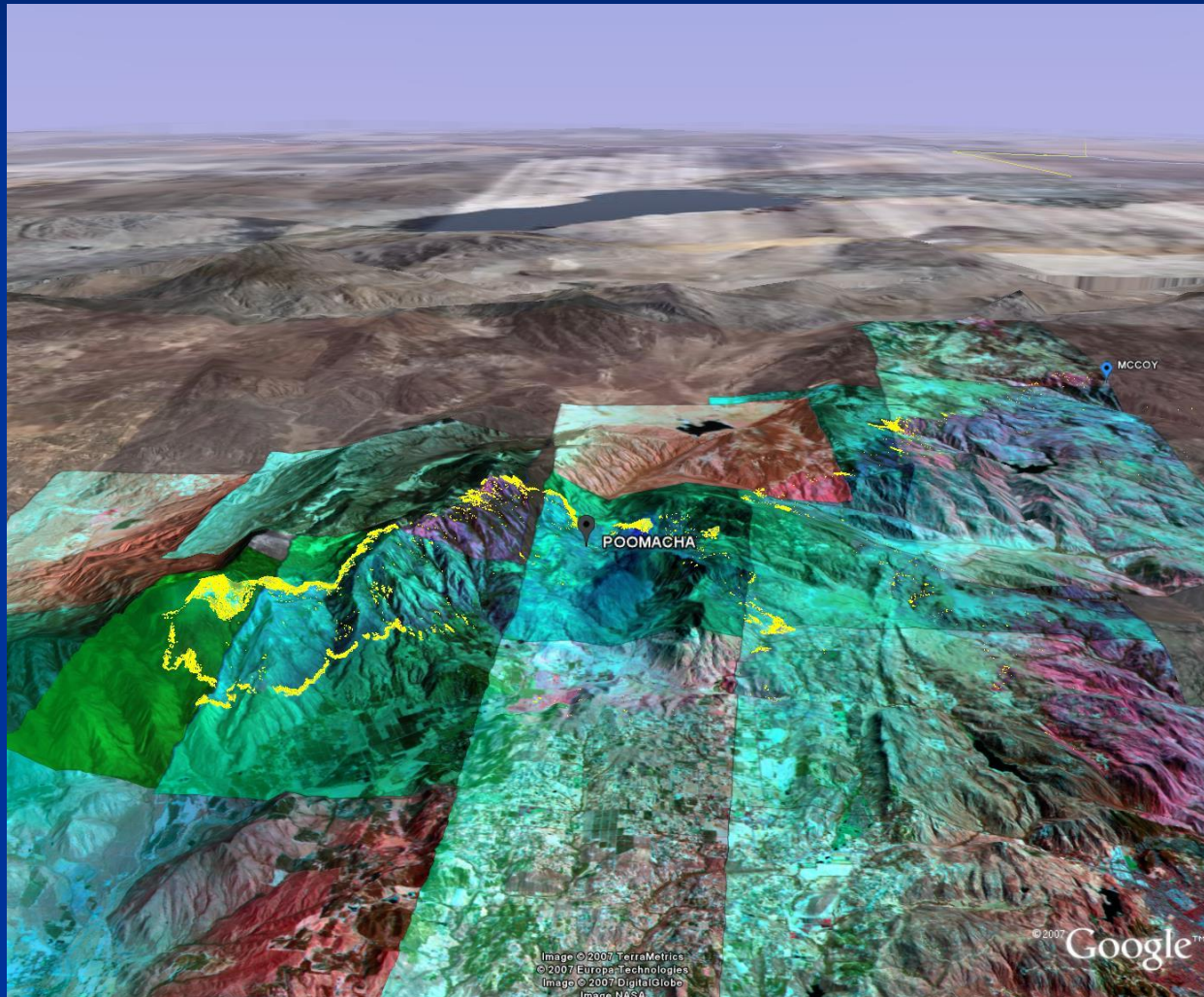
McCoy Fire



Ranch/Buckweed



Witch/Poomacha

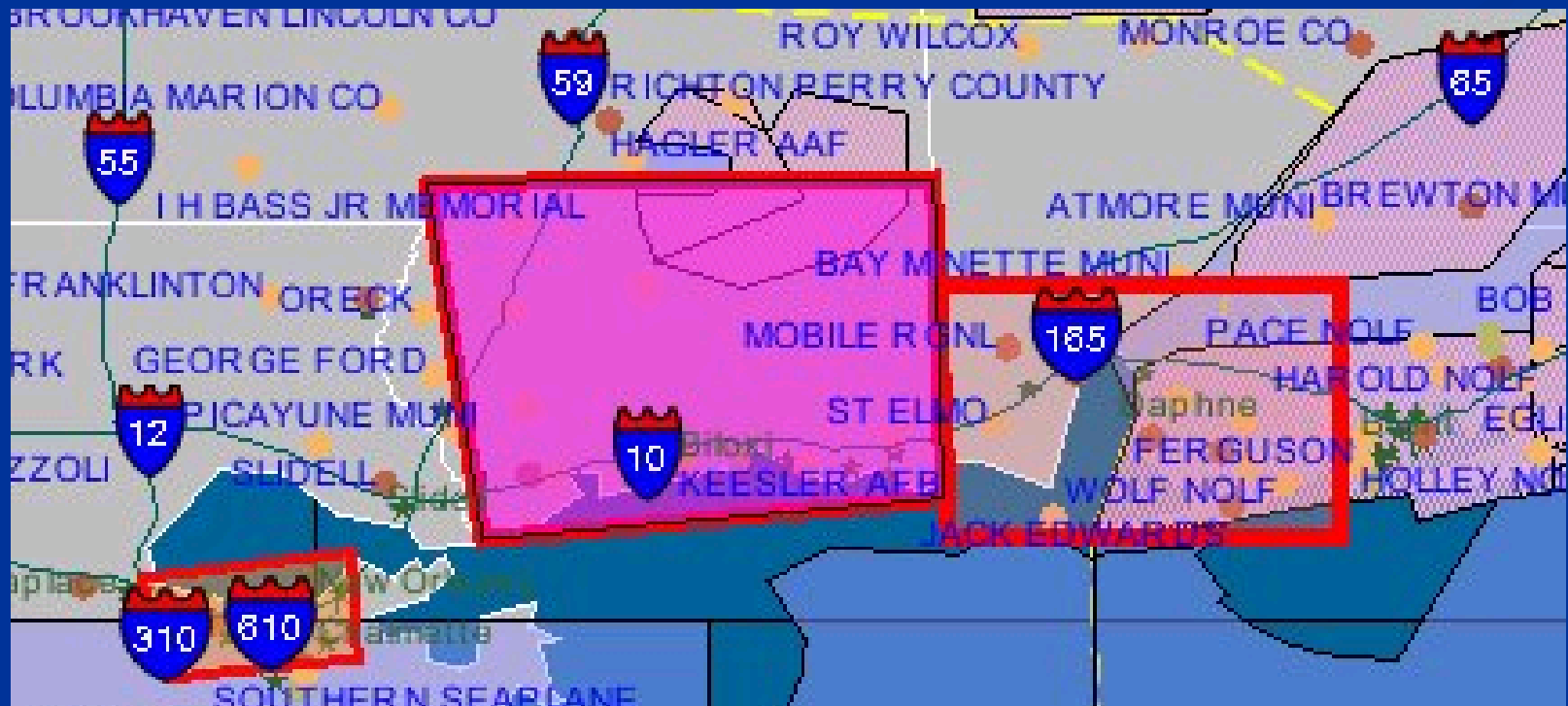


DOD Global Hawk Also Provided Imagery to the So Ops GACC



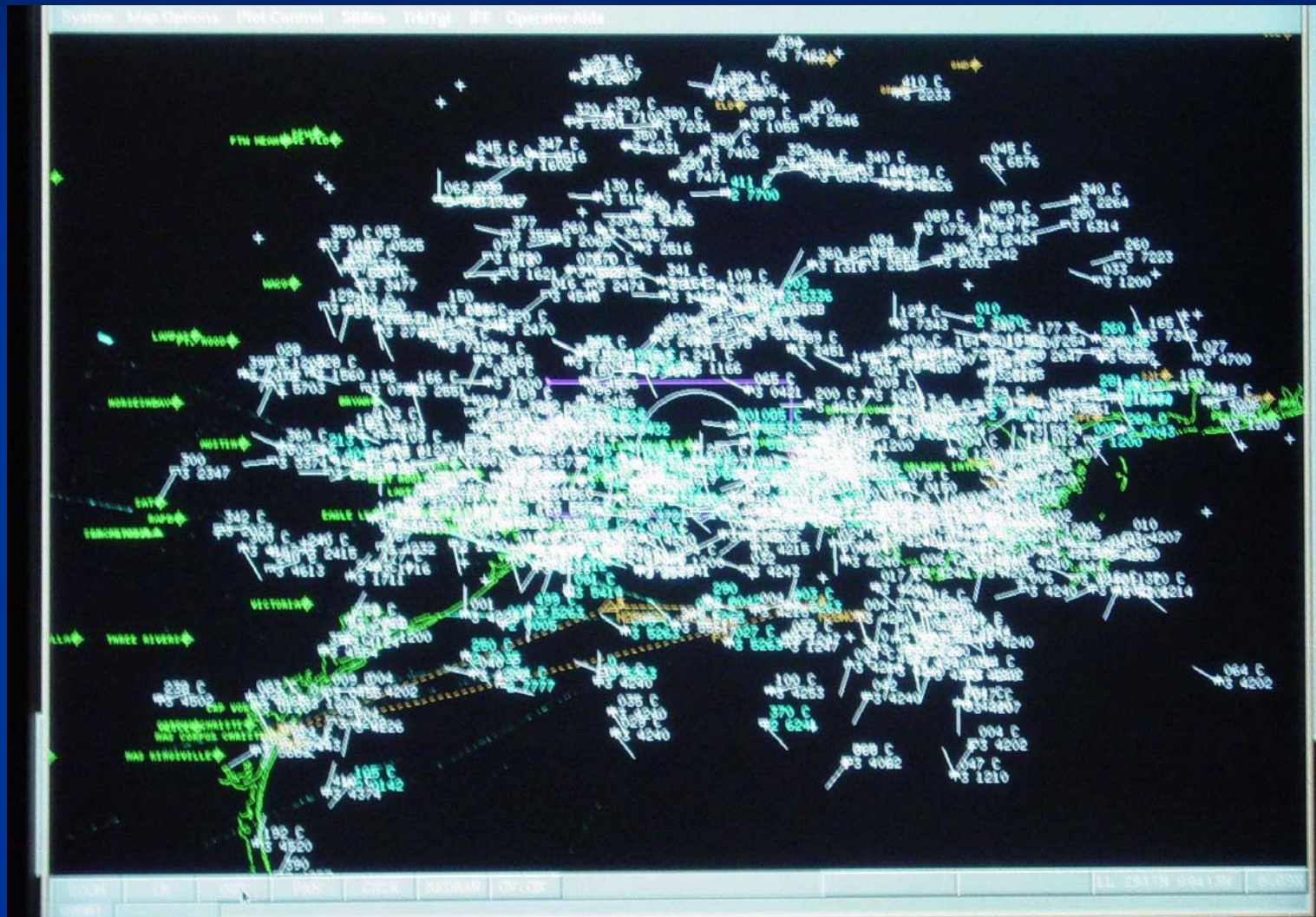
And it could be worse.....

- Mississippi TFR 4,338 Sq Miles
- Alabama TFR 2,031 Sq Miles
- New Orleans TFR 567 Sq Miles
- Combined Total 33,625 Square miles



Relief Aircraft on Hurricane Katrina

(What happens when ATC goes down)

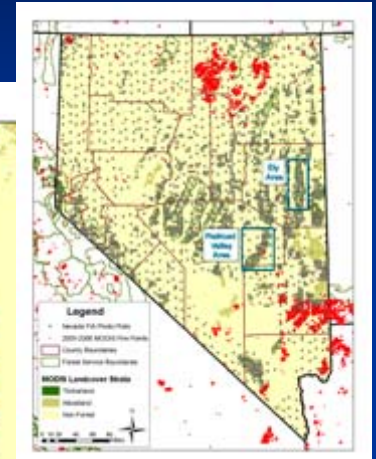
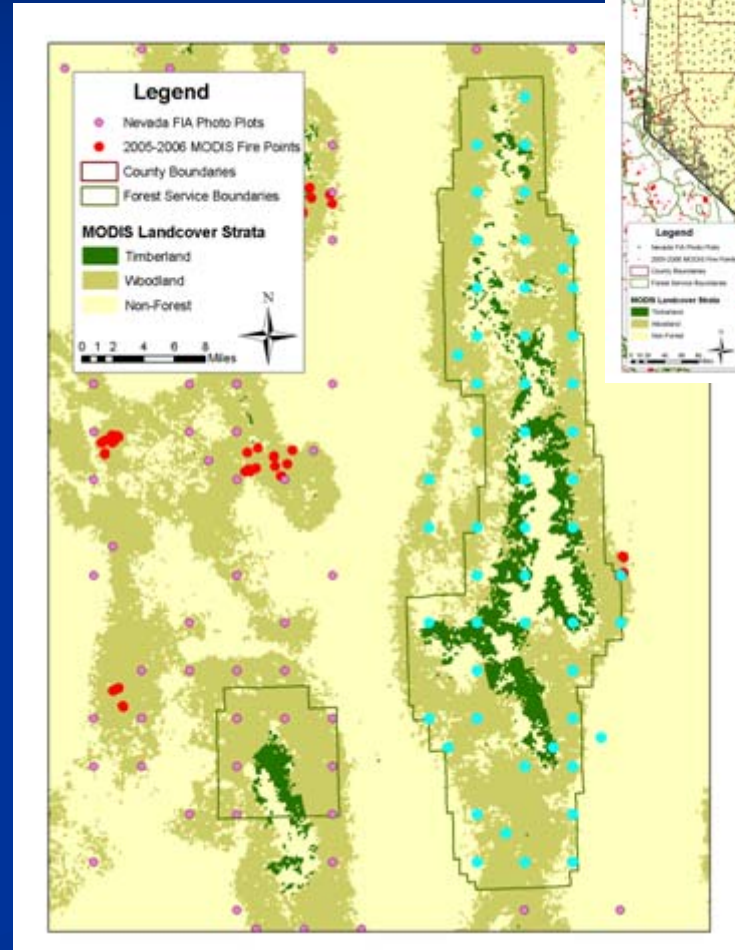


2008 (and future) Projects

- MDTC Project Continuation
- RSAC/WRAP Partnership Continuation
- Nevada FIH Project
- Development of the USFS Aviation Law Enforcement Project

FIA Nevada UAS Proposal

- Broad-scale, strategic-level inventory
- Interior West FIA's Nevada Photo-based Inventory Project (NPIP)
-



Special Thanks!

- Special Thanks to the FAA and NASA for all this assistance this past year! We couldn't have done all we did without your outstanding assistance



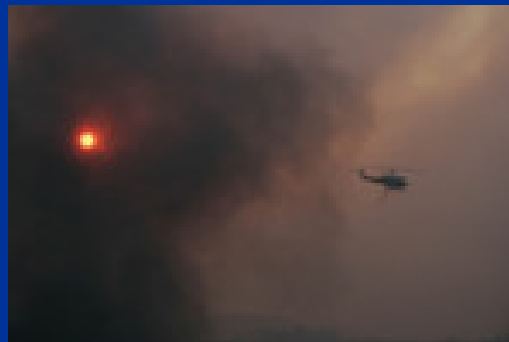
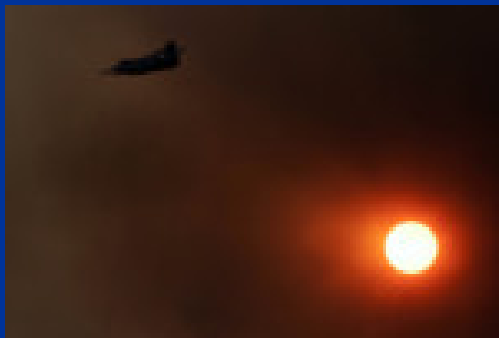
What have we learned so far....

- This is not the right “arena” for a chase plane
 - Smoke, night conditions, airspace issues
 - We utilize Lead Planes and Airborne Platforms already for safety reasons but they do not chase our aircraft around the fire.....



There is no test environment for our real mission

- There is no easy way to find out what capabilities of current UAS meet our needs
- We need some method to evaluate multiple UAS
- Firefighting response and testing methods can not be replicated unless you are in the real environment (Mountain terrain, smoke, wind, Incident Command Teams, Firefighters, etc)



Another difficulty

- It's difficult to “pick” the type UAS we want to test and do an airworthiness certificate until we can test the capability in our unique environment....



One Thought

- The **window of the future** for Unmanned aircraft is where traditionally manned aircraft are not successful (Reduced visibility, Smoke, Nighttime operations, etc)



More Importantly

- How can our unique missions help the FAA, Industry and other agencies succeed in designing the safe use of Unmanned Aircraft Systems??



The Sentinel by Tom Iraci